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TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

TRANSACTIONS

OF THE

Royal Academy of Medicine

IN IRELAND.

VOL. XXII.

EDITED BY

JOHN B. STORY, M.B., F.R.C.S.,

GENERAL SECRETARY;

SURGEON TO ROYAL VICTORIA EYE AND EAR HOSPITAL, DUBLIN.

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1893 ALLWORTHY, S. W., M.D., The Manor House, Antrim-road, Belfast.

† ATTHILL, LOMBE, M.D., Ex-President R.C.P., L.M.O.S., late Master Rotunda Lying-in Hospital, Monkstown Castle, Co. Dublin.

† BAKER, ARTHUR WYNDOWE WILBERT, M.D., F.R.C.S., Surgeon to the Dental Hospital of Ireland, Dental Surgeon to St. Mark's Ophthalmic Hospital, 59 Merrion-square, Dublin.

† BALL, SIR CHARLES BENT, M.D., F.R.C.S., Regius Professor of Surgery, Univ. Dub., Surgeon Sir P. Dun's Hospital, 24 Merrion-square, N., Dublin.

1903 BALL, CHARLES ARTHUR K., M.D., 24 Merrion-square.

† BANKS, SIR JOHN, K.C.B., M.D., F.R.C.P., Physician Richmond, Whitworth, and Hardwicke Hospitals, Ex-President British Medical Association, Physician-in-Ordinary to His Majesty the King in Ireland, 45 Merrion-square, East, Dublin.

† BARTON, JOHN, M.D., Demonstrator of Anatomy, Royal College of Surgeons, 10 Mount-street Crescent, Dublin.

† BEATTY, JOSEPH, F.R.C.S., Surgeon Monkstown Hospital, 3 Howard-place, Kingstown.

† BEATTY, WALLACE, M.D., F.R.C.P., Physician Adelaide Hospital, 38 Merrion-square, E., Dublin.

† BENNETT, EDWARD HALLARAN, M.D., F.R.C.S., Surgeon to Sir P. Dun's Hospital, Professor of Surgery Trinity College, 26 Lower Fitzwilliam-street, Dublin.

† BENSON, ARTHUR HENRY, F.R.C.S., Ophthalmic Surgeon Royal City of Dublin Hospital, Surgeon Royal Victoria Eye and Ear Hospital, 42 Fitzwilliam-square, W., Dublin. [1]

† BENSON, J. HAWTREY, M.D., F.R.C.P., Consulting Physician Royal City of Dublin Hospital, 57 Fitzwilliam-square, N., Dublin.

1904 BEVERIDGE, W. J., L.R.C.P. & S., 4 Kenilworth Park, Harold's Cross-road.

† BERNARD, WALTER, F.R.C.P., 14 Queen-street, Londonderry.

1887 BERRY, WM., L.R.C.P. Edin., F.R.C.S., Surgeon Royal Albert Edward Infirmary, Appleton Cottage, Great George-street, Wigan.

1887 BEWLEY, HENRY T., M.D., F.R.C.P., Lecturer on Medical Jurisprudence and Hygiene, Trin. Coll., Physician Adelaide Hospital, 89 Merrion-square, Dublin.

1887 BIRMINGHAM, A., M.D., Professor of Anatomy Catholic University School, Cecilia-street.

1895 BLAYNEY, ALEX. J. M., M.A., M.B., B.Ch., F.R.U.I., Professor of Biology, Cath. Univ. Med. Sch., and Asst. Surgeon Mater Misericordiæ Hospital, 7 North Frederick-street, Dublin. [3]

1902 BOURKE, SURG. LT.-COL. J., Irishtown, Ballindine.

1891 BOYD, J. ST. CLAIR, M.D., Gynæcologist Ulster Hospital, 27 Victoria-place, Belfast.

1898 BRADSHAW, SAM. M. J., M.B., B.Ch., B.A.O., Dub., 1 Tempè-terrace, Dalkey.

1891 BROWNE, HENRY PETER, F.R.C.S.E., M. & L.M., R.C.P.I., L.R.C.S.I., ex-Medical Officer and Medical Officer of Health, Rathdown Union, West Malvern, Delgany, Greystones.

1883 BROWNE, J. WALTON, A.B., M.D., Surgeon to the Royal Hospital, 10 College-square, North, Belfast.

1884 BURGERS, JOHN J., F.R.C.S., late Assistant Surgeon to the Richmond Hospital, 22 Westland-row, Dublin.

1884 BURKE, JOHN RICHARD, M.D., Deputy Inspector-General Hospitals and Fleets, R.N., 25 Bessborough-terrace, N.C.R., Dublin.

1891 BYRNE, HERBERT U., M.B., B.Ch., Univ. Dublin, Medical Officer No. 4 Dispensary District, South Dublin Union, 15 Upper Merrion-street, Dublin.

1891 BYRNE, LOUIS A., L.R.C.P., F.R.C.S., Surgeon Jervis-street Hospital, 79 Harcourt-street, Dublin.

1898 CALWELL, W., M.A., M.D., M.Ch., L.M.R.C.P.I., Assistant Physician Belfast Royal Hospital, Consulting Physician to Ulster Hospital for Women and Children, 1 College-square, N., Belfast.

† CAMERON, SIR CHARLES A., C.B., M.D., F.R.C.S., Professor of Chemistry Royal College of Surgeons, Superintendent Medical Officer of Health, City and County Analyst, Dublin, 51 Pembroke-road, Dublin.

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1900 CLARKE-BAYLISS, J. W., L.R.C.P. & S., Stanfield House, The Park, Yeovil, Somersetshire.

1890 COADY, D. P., L.R.C.P. & S., Naas.

1897 COADY, ED. T., F.R.C.S., Clane, Co. Kildare.

1902 COCKLE, WALTER, M.D., 1 Elm Villa, St. Mary's-road, Ealing, London, W., Anæsthetist Metropolitan Ear, Nose and Throat Hospital.

1891 COFFEY, DENIS J., M.B., Professor of Practical Physiology Catholic University Medical School, Dublin.

1897 COLAHAN, NICHOLAS WHISTLER, M.D., M.Ch., Professor of Materia Medica and Therapeutics Queen's College, Villa, Galway.

1891 COLEMAN, JAMES BYRNE, C.M.G., M.D., F.R.C.P., Physician to Richmond, Whitworth, and Hardwicke Hospitals, and to Nat. Hosp. for Consumption, 9 Merrion-square, Dublin.

† COPPINGER, CHARLES, F.R.C.S., Surgeon to the Mater Misericordiæ Hospital, 11 Upper Merrion-street, Dublin.

† COSGRAVE, E. MACDOWEL, M.D., M.Ch., F.R.C.P., Professor of Botany and Zoology, R.C.S., Physician to Drumcondra Hospital and to Cork-street Fever Hospital, 5 Gardiner's-row, Dublin.

1901 COSTELLO, M. B., M.B., B.Ch., R.U.I., Clondoyle, Glenamaddy, Co. Galway.

1883 COX, MICHAEL F., F.R.C.P., Physician St. Vincent's Hospital, 26 Merrion-square, Dublin.

1899 CRAIG, JAMES, M.D., F.R.C.P., Physician Meath Hospital, 18 Merrion-square, Dublin.

† CRANNY, JOHN JOSEPH, M.D., F.R.C.S., Surgeon to Jervis-street Hospital, 17 Merrion-square, N., Dublin. [*Deceased.*]

1898 CRAWLEY, FRANK CHETWODE, M.D., B.Ch., Univ. Dub., 41 Lower Baggot-street, Dublin.

1884 CRONYN, JOHN G., L.R.C.S., L.R.C.P., Medical Officer South Dublin Union Workhouse, 4 Clare-street, Dublin.

1897 DARGAN, W. J., M.B., B.Ch., B.A.O., Assistant Physician to St. Vincent's Hospital, 45 St. Stephen's-green.

1889 DAVIS, F. A. G., M.B., L.R.C.S., Demonstrator of Anatomy, R.C.S. 30 York-street, Dublin.

1893 DAWSON, W. R., M.B. Univ. Dublin, Farnham House, Finglas, Co. Dublin. [2]

1899 DEMPSEY, ALEX., M.D., Q.U.I., Physician Mater Infirmorum Hospital, Clifton-street, Belfast. [1]

1891 DEMPSEY, MARTIN J. P., M.D. R.U.I., F.R.C.P., Professor of Materia Medica and Therapeutics, Catholic University, Physician to Mater Misericordiæ Hospital, 35 Merrion-square, Dublin.

1900 DEMPSEY, PAT. J., M.R.C.S.E., L.R.C.P.L., 7 Merrion-square, Dublin.

† DENHAM, J. KNOX, L.R.C.P., Medical Officer to Donnybrook Dispensary, 67 Lower Baggot-street, Dublin.

1897 DIXON, A. FRANCIS, M.B. Dub., Professor of Anatomy, Trin. Coll., Dublin, 35 Palmerston-road. [1]

1895 DOWLING, JEREMIAH, L.R.C.P. & F.R.C.S., Nelson-street, Tipperary.

1895 DRURY, H. C., M.D., B.Ch., Univ. Dub., F.R.C.P., Physician Sir P. Dun's Hospital and Cork-street Fever Hospital, 48 Fitzwilliam-square, Dublin. [2]

1893 DUNNE, F. J., M.B., R.U.I., late Resident Physician Mater Misericordiæ Hospital, 94 Lower Leeson-street, Dublin.

1885 DWYER, F. CONWAY, M.D., Surgeon Meath Hospital, Professor of Surgery Royal College of Surgeons, 9 Rutland-square, Dublin.

1889 EARL, HENRY CECIL, M.D., late Assistant to Professor of Physiology, Trinity College, 72 Pembroke-road, Dublin. [2]

† ELLIS, GEORGE, F.R.C.S., M.B., 91 Lower Leeson-street, Dublin.

1883 EVANS, WILLIAM R., M.D., L.R.C.S., 19 Merrion-square, N., Dublin.

1887 FALKINER, NINIAN M'INTIRE, M.B., F.R.C.P., Medical Superintendent of Statistics, Registrar-General's Office, 5 Victoria-road, Rathgar.

1900 FANNIN, EDWARD M., M.B., B.Ch. Dubl., 3 Rutland-square.

1888 FERGUSON, HENRY LINDO, M.D., F.R.C.S., Dunedin, New Zealand.

† FINNY, JOHN MAGEE, M.D., F.R.C.P., Physician Sir P. Dun's Hospital, King's Professor of Practice of Medicine, School of Physic, late President R.C.P., 36 Merrion-square, Dublin.

1902 FITZGERALD, GORDON WM., M.B., Assistant Master, Rotunda. [1]

† FITZGERALD, CHARLES E., M.D., F.R.C.P., Surgeon-Oculist-in-Ordinary to the King in Ireland, 27 Upper Merrion-street, Dublin.

1891 FITZGERALD, FRANCIS CREIGHTON, L.R.C.P., L.R.C.S., Medical Officer Dispensary District, Newtownbutler, Co. Fermanagh.

1902 FITZGIBBON, GIBBON, M.D., B.Ch., B.A.O., Assistant Master, Rotunda.

† FITZGIBBON, HENRY, F.R.C.S., Ex-President Royal College of Surgeons, late Surgeon City of Dublin Hospital, 49 Merrion-square, E., Dublin.

1884 FLEMING, ROBERT H., M.B., late Assistant Physician Rotunda Hospital, 30 Lower Baggot-street, Dublin.

1891 FLYNN, ROBERT ALEXANDER, F.R.C.P., L.R.C.S., late Assistant Master Rotunda Hospital, Gynæcologist Drumcondra Hospital, 55 Merrion-square, Dublin.

1898 FOGERTY WILLIAM, M.D., M.Ch., M.A.O. R.U., 67 George-street, Limerick.

1886 FOTTRELL, WM. JOSEPH, L.R.C.S., Medical Officer North Dublin Union Workhouse, 2 Rutland-square, Dublin.

† FRANKS, SIR KENDAL, M.D., F.R.C.S., late Surgeon to Adelaide Hospital and to Throat and Ear Hospital, Dublin, Kilmurry, Johannesburg, South Africa.

1887 FRASER, ALEC, M.B., Professor of Anatomy Royal College of Surgeons, Ireland.

1891 GLENN, JOHN HUGH ROBERT, M.D., B.Ch., late Assistant Physician Rotunda Hospital, 24 Lower Baggot-street, Dublin.

1898 GOLDIE, GEORGE J., L.R.C.P. & S. Edin., L.F.P. & S. Glasgow, L.D.S. Edin., 95 Merrion-square.

1893 GORDON, THOMAS EAGLESON, M.B. Univ. Dublin, Surgeon Adelaide Hospital, 4 Fitzwilliam-square, Dublin. [1]

† GREENE, THOMAS WM. NASSAU, L.R.C.S., 45 Dartmouth-square, Dublin.

1902 GUNN, L. G., M.D., Dub., F.R.C.S.I., Assistant Surgeon Adelaide Hospital, 43 Fitzwilliam-square. [1]

1892 HAMILTON, WM. COPE, L.R.C.S. & P., late Resident Surgeon Steevens' Hospital, 120 St. Stephen's-green, W., Dublin.

† HARLEY, ROBERT WILLIAM, L.R.C.S., 21 Pembroke-road, Dublin.

1899 HAUGHTON, W. S., B.A., M.B., Dublin, Surgeon to Steevens' Hospital, 30 Lower Fitzwilliam-street.

† HAYES, RICHARD ATKINSON, M.D., F.R.C.S., Physician Steevens' Hospital, Physician for Diseases of Throat, Royal Victoria Eye and Ear Hospital, 82 Merrion-square, South, Dublin.

1896 HEARD, R. LYNN, M.B., B.Ch., R.U., Munster Lodge, Monkstown.

1901 HENNESSY, MRS. H. L., L.R.C.P. & S., M.D. (Brux.), 56 Fitzwilliam-square.

† HEPBURN, WILLIAM JOSEPH, F.R.C.S. Edin., Surgeon Meath Hospital and Co. Dublin Infirmary, 31 Upper Merrion-street, Dublin.

† HEUSTON, FRANCIS TYDD, F.R.C.S., late Professor of Anatomy Royal College of Surgeons, Surgeon Adelaide Hospital, 15 St. Stephen's-green, N., Dublin.

† HORNE, ANDREW JOHN, F.R.C.P., Vice-President R.C.P., Master National Lying-in Hospital, 94 Merrion-square, W., Dublin.

1883 JACOB, DAVID BALDWIN, M.D., F.R.C.S., Surgeon Queen's County Infirmary, Visiting Physician Maryborough District Lunatic Asylum, Surgeon Queen's County Prison, Port Leix, Maryborough, Queen's Co.

1890 JELLETT, HENRY, M.B., B.Ch., Univ. Dublin, Ex-Assistant Master Rotunda Hospital, 61 Lower Mount-street. [1]

1885 JENINGS, ULICK A., M.D., Brigade Surgeon, M.S., Retired, Military Prison, Rockspring House, Cork.

1897 JOHNSTON, G. JAMESON, M.B., B.Ch., B.A.O., R.U.I., Surgeon Royal City of Dublin Hospital, 13 Lower Fitzwilliam-street.

1893 JOYNT, RICHARD LANE, M.D. Univ. Dublin, F.R.C.S., Surgeon Meath Hospital, 84 Harcourt-street, Dublin.

1899 KENNEDY DENIS, F.R.C.S., L.R.C.P., Assistant Surgeon Children's Hospital, Temple-street, Demonstrator of Anatomy R.C.S.I., 39 Harrington-street. [1]

1884 KIDD, FRED. W., M.D., ex-Master Coombe Hospital, 17 Lower Fitzwilliam-street, Dublin.

† KINKEAD, RICHARD JOHN, M.D., L.R.C.S., Lecturer on Medical Jurisprudence, Professor of Obstetric Medicine, Queen's College, Galway, Foster House, Galway.

1899 KIRKPATRICK, T. PERCY, M.D. Dub., Demonstrator of Anatomy T.C.D., Physician to Steevens' Hospital, 23 Lower Baggot-street.

1885 LANE, JOHN LILLY, M.B., late Assistant Physician Rotunda Hospital, Gynæcologist Royal City of Dublin Hospital, 37 Lower Baggot-street, Dublin.

1901 LAW, S. HORACE, M.D., F.R.C.S., Throat Surgeon Adelaide Hospital, Surgeon Dublin Throat and Ear Hospital, 48 St. Stephen's-green.

1884 LEDWICH, EDWARD L'E., L.R.C.S., College Anatomist Royal College of Surgeons, 30 Upper Fitzwilliam-street, Dublin.

1900 LEEPER, RICHARD R., F.R.C.S., St. Patrick's Hospital, Dublin.

1891 LENNON, EDWARD EMMANUEL, F.R.C.P., L.R.C.S., Senior Assistant Physician Meath Hospital, 22 Merrion-square, Dublin.

† LENTAIGNE, JOHN, F.R.C.S., Surgeon Mater Misericordiæ Hospital, 5 Upper Merrion-street, Dublin.

1897 LETTERS, PATRICK, M.D., Valentia Island.

1898 LINDSAY, JAMES A., M.D., R.U., 13 College-square, E., Belfast.

† LITTLE, JAMES, M.D., F.R.C.P., Regius Professor of Physic Univ. Dub., ex-President Royal College of Physicians, 14 St. Stephen's-green North, Dublin.

1897 LUMSDEN, JOHN, M.D., B.Ch., B.A.O. Dub., Physician to Mercer's Hospital, 4 Fitzwilliam-place.

1884 LUSH, WILLIAM VAWDREY, M.D., F.R.C.P. Lond., F.R.C.S. Eng., Physician to the Dorset County Hospital, 12 Frederick-place, Weymouth.

† MACAN, SIR ARTHUR V., M.B., M.A.O., F.R.C.P., Professor of Midwifery T.C.D., 53 Merrion-square, Dublin.

† M'ARDLE, JOHN STEPHEN, F.R.C.S., Surgeon St. Vincent's Hospital and the Mullen Convalescent Home, 7 Merrion-street, Upper, Dublin.

1887 M'CAUSLAND, RICHARD BOLTON, F.R.C.S., Surgeon Steevens' Hospital, 79 Merrion-square, Dublin.

1899 M EVOY, THOMAS, L.R.C.P. & S., 1 Prince Edward-terrace, Blackrock, Co. Dublin.

1904 M'GRATH, JAMES JOSEPH, L.R.C.P., St. Helens, Dunfanaghy.

1895 M'HUGH, MICHAEL, M.A., M.D., Univ. Dub., L.R.C.S., Physician St. Vincent's Hospital, 25 Harcourt-street, Dublin.

1902 M'KISACK, H. L., M.D., 15 College-square, Belfast.

1904 MACNEICE, J. G., Lt.-Col., R.A.M.C., Temporary Fellow, 3 Longfield-terrace, N.C.R.

1903 MCVITTIE, R. B., M.D., 62 Fitzwilliam-square. [1]

1887 MCWEENEY, E. J., M.D., M.Ch., Pathologist Mater Misericordiæ Hospital, 84 St. Stephen's-green, Dublin. [1]

1901 MAGENNIS, E., M.D., 37 Harcourt-street.

1900 MAGUIRE, KATHARINE M. N., M.B., B.Ch., 67 Merrion-square, South, Dublin.

1883 MARQUES, L. PEREIRA, M.R.C.P., L.R.C.S., late Medical Officer Victoria Gaol Hospital, Macao, China.

† MARTIN, WILLIAM JAMES, M.D., F.R.C.P. Edin., Physician Jervis-street Hospital and St. Joseph's Infirmary for Children, 17 Harcourt-street, Dublin.

1896 MARTLEY, FRANCIS C., M.A., M.D., Camb., M.R.C.S. Eng. & L.R.C.P. Lond., late House Physician St. Mary's Hospital, Anæsthetist to Steevens' Hospital, 32 Upper Merrion-street, Dublin. [1]

1897 MAUNSELL, R. CHARLES B., M.B., B.Ch., B.A.O., Dub., F.R.C.S.I., Surgeon to Mercer's Hospital, 32 Lower Baggot-street. [2]

1902 MELDON, G. PUGIN, L.R.C.P. & S., 15 Merrion-square.

1883 MIDDLETON, WILLIAM HENRY, L.R.C.S., Surgeon Westmeath Co. Infirmary, Mullingar, Co. Westmeath.

1904 MILLS, JOHN, M.B., B.S., R.U.I., District Asylum, Ballinasloe.

1901 MITCHELL, A. B., F.R.C.S., 4 College-square, Belfast.

† MONTGOMERY, ALEXANDER NIXON, F.R.C.P., Secretary Vaccination Department, Local Government Board, 45 Upper Sackville-street, Dublin.

1894 MONTGOMERY, ROBERT JOHN, M.A., M.B. Univ. Dublin, F.R.C.S., Ophthalmic Surgeon Drumcondra Hospital, Assistant Surgeon Royal Victoria Eye and Ear Hospital, 4 Gardiner's-row, Dublin, and 18 Westland-row, Dublin.

1897 MOONEY, H. C., M.B., F.R.C.S., 22 Lower Baggot-street.

† MOORE, CHARLES FREDERICK, M.D., F.R.C.S., Certifying Surgeon, Medical Inspector of Seamen, 10 Upper Merrion-st., Dublin. [*Deceased.*]

1894 MOORE, HENRY, L.R.C.P. & S., Surgeon Royal City of Dublin Hospital, 40 Lower Baggot-street.

† MOORE, Sir JOHN WILLIAM, M.D., F.R.C.P., Physician Meath Hospital, Professor of Practice of Medicine Royal College of Surgeons, 40 Fitzwilliam-square, West, Dublin. [2]

1901 MOORHEAD, GEORGE, F.R.C.S., Tullamore.

1904 MOORHEAD, T. GILLMAN, M.D., B.Ch., Dub., Physician City of Dublin Hospital, 12 Lower Fitzwilliam-street. [1]

1897 MORRISON, F. SAUNDERSON, F.R.C.S., Hollaton, Leicestershire.

1883 MURPHY, JOHN, F.R.C.P., L.R.C.S., Physician Mater Misericordiæ Hospital, 13 Merrion-square, Dublin.

† MURPHY, JOHN JOSEPH, L.R.C.P. Ed., 18 Harcourt-street, Dublin.

1886 MYLES, SIR T., F.R.C.S., Surgeon Richmond Hospital, 33 Merrion-square, Dublin. [1]

1902 NEVILLE, W. C., M.D., M.A.O., F.R.C.P., Pathologist Rotunda Hospital, 70 Lower Mount-street.

† NIXON, SIR CHRISTOPHER, M.D., F.R.C.P., Physician to Mater Misericordiæ Hospital, 2 Merrion-square, N., Dublin.

1889 NOLAN, MICHAEL JAMES, L.R.C.P., L.R.C.S., Resident Medical Superintendent Down District Lunatic Asylum, Downpatrick.

1885 NORMAN, CONOLLY, F.R.C.P., Medical Superintendent Richmond District Lunatic Asylum, Dublin.

1899 O'BRIEN, C. M., M.B., L.R.C.P.& S., Physician to City Hospital for Diseases of the Skin and Cancer, 29 Merrion-square. [1]

† O'CARROLL, JOSEPH FRANCIS, M.D., F.R.C.P., Physician Richmond, Whitworth, and Hardwicke Hospitals, 43 Merrion-square, Dublin.

1883 OLPHERTS, J. WYBRANTS, M.D., Medical Officer Downpatrick Dispensary District, The Villas, Downpatrick.

1900 O'NEILL, HENRY, M.D., M.Ch., J.P., Consulting Surgeon Royal Victoria Hospital, Curator Museum of Sanitary Science, 6 College-square, Belfast.

1883 O'NEILL, WILLIAM, M.D., M.R.C.P. Lond., Physician Lincoln Lunatic Hospital, 2 Lindum-road, Lincoln.

† ORMSBY, SIR LAMBERT HEPENSTAL, M.D., F.R.C.S., Surgeon Meath Hospital, Surgeon National Orthopædic and Children's Hospital, 92 Merrion-square, West, Dublin. [1]

1894 O'SULLIVAN, A. C., M.D., F.T.C.D., Lecturer on Pathology Trinity College, 43 Ailesbury-road, Dublin.

† OULTON, HENRY W., M.D. Dubl., F.R.C.S.I., Chief Surgeon Dublin Metropolitan Police, 17 Upper Fitzwilliam-street, Dublin.

1898 PARSONS, ALFRED ROBERT, M.D. Univ. Dublin, F.R.C.P., Physician City of Dublin Hospital, 27 Lower Fitzwilliam-street, Dublin. [1]

1900 PATTEN, CHARLES J., M.D., B.Ch. Dub., University College, Sheffield.

1895 PEACOCKE, GEO., M.D., F.R.C.P.I., 14 Lower Fitzwilliam-street.

1903 PEACOCK, REGINALD C., M.B., B.Ch., M.D. Dub., Medical Officer G. P. O., Blackrock District, 2 Ovoca-terrace, Blackrock.

1887 PEARSON, CHARLES YELVERTON, M.D., F.R.C.S. Eng., Professor of Materia Medica, Queen's College, 1 Sydney-place, Cork.

† PECHEY-PHIPSON, MARY EDITH, M.D., L.R.C.P., Dasak Bungalow, Nasik-road, Bombay.

1901 PENNY, ALFRED FERGUSON, L.R.C.P. & S., Hon. Visiting Physician Chelsea Prov. Dispensary, 10 Oakley-street, Chelsea.

† POLLOCK, JAMES FERRIER, M.D., F.R.C.P., Medical Officer Meath Industrial Schools, Avoca House, Blackrock.

1885 POTTER, HENRY, F.R.C.S., Brigade Surgeon Indian Army, Dartmouth, Dartry-road, Up. Rathmines, Co. Dublin.

1901 POWELL, CALEB J., F.R.C.S., Visiting Surgeon North Dublin Union Dispensary, 30 Harcourt-street.

1895 PRICE, ARTHUR GEORGE, M.B., B.Ch. Univ. Dublin, Greystones.

† PUREFOY, RICHARD DANCER, F.R.C.S., Ex-Master Rotunda Hospital, 62 Merrion-square, Dublin. [2]

1902 PURSER, FRANK C., M.D., B.Ch., B.A.O., Pathologist Dr. Steevens' Hospital, 20 Lower Baggot-street.

† REDMOND, JOSEPH MICHAEL, M.D., F.R.C.P., Physician to Mater Misericordiæ Hospital, Senior Physician to Cork-street Fever Hospital, 41 Merrion-square, Dublin.

1903 RIDLEY, GEORGE, P., L.R.C.P., L.R.C.S., Surgeon King's Co. Infirmary, Tullamore.

1891 ROCHE, ANTHONY, M.R.C.P., L.R.C.S., Professor of Medical Jurisprudence and Public Health Catholic University Medical School, 60 Lower Baggot-street.

1892 RUTHERFORD, WILLIAM, M.D., F.R.C.P.Ed., Visiting Physician District Asylum, Ballinasloe.

1900 SCOTT, C. BENNETT, M.D., B.Ch., B.A.O. Dub., 35 Clarinda Park, Kingstown, Co. Dublin.

† SCOTT, JOHN ALFRED, M.D., F.R.C.S., Professor of Physiology Royal College of Surgeons, 36 Lower Baggot-street, Dublin.

1900 SINCLAIR, F. HOWARD, M.D., Rostrevor Sanatorium.

1886 SMITH, ALFRED J., M.B., Gynæcologist St. Vincent's Hospital, 30 Merrion-square, Dublin. [1]

1895 SMITH, R. TRAVERS, M.B., B.Ch. Univ. Dub., 20 Lower Fitzwilliam-street. [1]

1901 SMITH, TREVOR N., M.D., 34 Upper Fitzwilliam-street.

† SMITH, WALTER GEORGE, M.D., Ex-President R.C.P., King's Professor of Materia Medica School of Physic, and Physician to Sir Patrick Dun's Hospital, 25 Merrion-square, Dublin. [1]

† SMYLY, SIR PHILIP CRAMPTON, M.D., F.R.C.S., Surgeon Meath Hospital, Surgeon to the Hospital for Throat and Ear Diseases, 4 Merrion-square, North, Dublin. [*Deceased.*]

† SMYLY, WILLIAM JOSIAH, M.D., F.R.C.P., late Master Rotunda Lying-in Hospital, 58 Merrion-square, S., Dublin.

1903 STAUNTON, MICHAEL C., M.D., B.Ch., B.A.O. R.U.I., Visiting Surgeon Children's Hospital, Temple-street, 22 North Frederick-street.

† STOKER, SIR THORNLEY, M.D., ex-President R.C.S., Surgeon Richmond Hospital, Surgeon Swift's Hospital for Lunatics, 8 Ely-place, Dublin. [1]

1902 STOKER, GRAVES, F.R.C.S., 46 Rutland-square.

† STORY, JOHN BENJAMIN, M.B., F.R.C.S., Surgeon Royal Victoria Eye and Ear Hospital, Ophthalmic and Aural Surgeon Steevens' Hospital, Professor of Ophthalmic and Aural Surgery R.C.S., 6 Merrion-square, N., Dublin.

1889 STORY, W. G., M.B., B.Ch., 8 Upper Fitzwilliam-street, Dublin.

1900 STRAHAN, MICHAEL, L.R.C.S., Medical Officer No. 2 North City Dispensary District, 38 Rutland-square, Dublin.

1902 STRITCH, GEO. S. RUSSELL, L.R.C.P. & S. Ed., L.F.P. & S. Gl., Medical Officer Westmoreland Lock Hospital, 17 North Great George's-st.

† SWAN, ROBERT LAFAYETTE, F.R.C.S., Surgeon Steevens' Hospital and Dublin Orthopædic Hospital, 32 St. Stephen's-green, N., Dublin.

† SWANZY, HENRY ROSBOROUGH, M.B., F.R.C.S., Surgeon Royal Victoria Eye and Ear Hospital, Dublin, Ophthalmic Surgeon Adelaide Hospital, 23 Merrion-square, North, Dublin.

1893 SYMES, WM. LANGFORD, F.R.C.P., M.D., Assistant Physician Dublin Orthopædic Hospital, Physician Homes for Destitute Children, 74 Merrion-square, South, Dublin. [1]

1893 SYMINGTON, JOHNSON, M.D. Edin., Professor of Anatomy Queen's Coll., Belfast.

1895 TAYLOR, EDWARD HENRY, M.B., B.Ch., Univ. Dub., F.R.C.S., Surgeon Sir Patrick Dun's Hospital, 29 Lower Baggot-street, Dublin. [1]

1898 TAYLOR, WILLIAM, F.R.C.S., Surgeon Meath Hospital, Demonstrator of Anatomy and Operative Surgery R.C.S., 32 Harcourt-street. [1]

1887 THOMPSON, S. M., L.R.C.P., L.R.C.S., 34 Harcourt-street, Dublin.

1897 THOMPSON, W. H., M.D., F.R.C.S. Eng., Professor of Institutes of Medicine, Trinity College, Dublin.

1894 THOMPSON, W. J., M.D. Univ. Dublin, Physician Jervis-street Hospital, 27 Harcourt-street, Dublin.

† THOMSON, SIR WILLIAM, C.B., F.R.C.S., ex-President R.C.S., Surgeon Richmond Hospital, 54 St. Stephen's-green, E., Dublin.

1891 TICHBORNE, CHARLES ROBERT CLARKE, LL.D., L.R.C.S., Professor of Chemistry Pharm. Society, Ireland, 15 North Great George's-street, Dublin.

† TOBIN, RICHARD FRANCIS, F.R.C.S., Surgeon St. Vincent's Hospital, 60 St. Stephen's-green, Dublin. [2]

1889 TODD, H. ROSS, L.R.C.P., L.R.C.S., Bembridge House, Bembridge.

1893 TWEEDY, ERNEST HASTINGS, L.R.C.P., L.R.C.S., Master Rotunda Hospital. [1]

1900 TWEEDY, HERBERT, L.R.C.P. & S., Colonial Surgeon, 71 Lower Baggot-street, Dublin.

† USHER, ISAAC WILLIAM, L.R.C.S., Medical Officer Dundrum No. 1 Dispensary, Rathdown Union, Tudor House, Dundrum, Co. Dublin.

1901 WATSON, EDWARD J., M.D., B.Ch., B.A.O. Dub., L.R.C.P., Anæsthetist and Medical Officer in Charge of the X-ray Department Sir P. Dun's Hospital, Demonstrator in Anatomy T.C.D., 25 Fitzwilliam-place.

1902 WAYLAND, R. S., F.R.C.S., 54 South Richmond-street.

1901 WESTROPP, H. G., L.R.C.P. & S., 15 Strand-road, Sandymount.

1904 WHEELER, W. I. deC., M.D., B.Ch., B.A.O. Dub., Hon. Surgeon Female Presbyterian Orphanage, 59 Lower Mount-street.

1900 WHITE, ARTHUR H., Professor of Pathology Royal College of Surgeons, Derrybawn, Rathgar.

1903 WIGHAM, JOSEPH T., M.B., Albany House, Monkstown, Co. Dublin.

1898 WIGODER, SELIK, M.D. Leipzig, L.R.C.P. & S. Edin., 5 Harrington-street.

1894 WILSON, T. HENRY, M.R.C.P., late Assistant Master Rotunda Lying-in Hospital, 33 Upper Merrion-street, Dublin.

1899 WILSON, G. O'KEEFFE, F.R.C.S., Physician Drumcondra Hospital and to Cork-st. Fever Hospital, 34 North Frederick-street.

1898 WINTER, W. A., M.D., B.Ch. Dub., 2 Upper Leeson-street.

1893 WOODS, ROBERT H., M.B. Univ. Dub., F.R.C.S., Throat Surgeon Richmond Hospital, 39 Merrion-square, Dublin.

1894 WYNNE, ALBERT E., L.R.C.P. & S. Edin., late House Surgeon Mercer's Hospital, 187 Great Brunswick-street, Dublin.

1884 YOURELL, M. J., M.R.C.P., 21 Northbrook-road, Dublin.

MEMBERS.

1900 BEATTY, ELIZABETH, L.R.C.P. & S., L.F.P. Glasgow, 18 Upper Merrion-street.

† BOYCE, JOS. W., M.B., Medical Officer Blackrock Dispensary District, St. Kilda, Blackrock, Co. Dublin.

1897 BOYD, ALFRED E., M.B., 53 Harcourt-street, Dublin.

1897 BURNES, RUDOLPH A. C., M.B., B.Ch. Dub., 1 St. John's-terrace, N. C. Road.

1902 CAHILL, FRANCIS, L.R.C.P. & S., Medical Officer Dundrum Dispensary District, Co. Dublin.

1903 CHARLES, ANDREW, L.R.C.P. & S., 103 Donore-avenue, S.C.R.

1887 COPE, GEO. PATRICK, L.R.C.P., L.R.C.S., late Assistant Resident Medical Superintendent Richmond District Lunatic Asylum, Medical Officer No. 3 Dispensary District, South Dublin Union, 36 Harcourt-street.

1900 CULLINAN, HENRY, L.R.C.P. & S., Richmond Asylum.

1892 DAY, J. MARSHALL, M.B. Univ. Dublin, Resident Medical Officer Cork-street Fever Hospital, Dublin.

† DELAHOYDE, J. O'CONNELL, L.R.C.S., Medical Officer No. 2 District North Dublin Union, 47 Rutland-square, Dublin.

1894 EUSTACE, H. M., M.D., B.Ch. Univ. Dublin, Asst. Physician Highfield Private Lunatic Asylum, Hampstead, Glasnevin.

1896 FAGAN, P. J., F.R.C.S., Demonstrator of Anatomy Catholic University Medical School, 31 North Frederick-street.

1897 FLEURY, ELEONORE LILIAN, M.D., R.U.I., Richmond District Asylum, Dublin.

1903 GLENNY, EDMUND, L.R.C.P. & S., 14 Harrington-street.

1900 GOFF, A. S., L.R.C.P. & S., Lynton, Dundrum.

1889 GOULDING, H. BENSON, L.R.C.P. Edin., F.R.C.S., 16 Rathmines-road.

1900 HARVEY, ROBERT JAMES, L.R.C.P. & S., Assistant Surgeon Richmond Hospital, 1 Rutland-square.

1898 HATCH, RICHARD, L.R.C.P. & S., 166 Pembroke-road.

1897 HUGHES, CHARLES, L.R.C.P. & S., 27 Westland-row.

1903 KEEGAN, J. F., L.R.C.P. & S., 6 Pembroke-road.

1902 LAMBE, FRANCIS W., M.B., B.Ch., B.A.O., R.A.M.C., 7 Cornwall-road, Dorchester, Dorset.

1903 LYNN, K., M.B., B.Ch., B.A.O., 9 Belgrave-road, Rathmines.

1901 MACRORY, ELIZABETH, M.B., B.Ch. Edin., L.M. Coombe, 48 Woodhead-street, Dunfermline.

1900 MATSON, J. AGAR, M.D., B.Ch. Dubl., 16 North Great George's-street, Dublin.

1902 NEILL, THOMAS, M.B., B.Ch. Dub., 69 Harcourt-street.

1898 REDINGTON, JOHN, L.R.C.P. & S., Richmond Asylum.

1885 SHAW, JAMES, L.R.C.S., 93 Talbot-street, Dublin.

† SPEEDY, ALBERT O., L.R.C.P. Ed., Medical Officer No. 3 Dispensary District, North Dublin Union, 28 North Frederick-street, Dublin. [*Resigned.*]

1904 STONEY, R. ATKINSON, M.B., B.Ch., B.A.O., Surgeon City of Dublin Hospital, 115 Lower Baggot-street. [1]

1900 TENNANT, ELIZABETH A., L.R.C.P. & S., 15 Harrington-street.

1895 TURNER, DAVID, L.R.C.P. & S., late Resident Medical Officer Royal Hospital for Incurables, 68 Grosvenor-road, Rathmines.

1902 WALSH, JAMES A., L.R.C.P. & S. Edin., 30 Westmoreland-street.

STUDENT ASSOCIATES.

BAKER, MISS MADELINE S., 173 Rathgar-road.

BRACKEN, A. J., Richmond Hospital.

HARGREAVE, MISS, 8 Upper Mount-street.

LYBURN, FRED., Orneau Villa, Newtown Smith, Sandycove.

MURPHY, R. N., 18 Harcourt-street.

O'REILLY, ALFRED, 75 Harcourt-street.

RUTHERFORD, JAMES WHIGHAM, Richmond Hospital.

RUTHERFORD, HENRY RICHARD CHARLES, Richmond Hospital.

SHEILL, J. SPENCER, Richmond Hospital.

TALBOT, SIDNEY W., 2 Tivoli-parade, Kingstown.

WOOLCOMBE, ROBERT LLOYD, LL.D., 14 Waterloo-road, Dublin.

RULES.

1. The name shall be, "ROYAL ACADEMY OF MEDICINE IN IRELAND." (1887.)

Constitution.

2. The Academy shall consist of Fellows, Honorary Fellows, Members, and Student Associates.

Management.

3. The affairs shall be managed by a Council, consisting of the President, Ex-Presidents (1893), the six Presidents of Sections, the General Secretary and Treasurer, the Secretary for Foreign Correspondence, six Secretaries of Sections, and eight Councillors, being two representatives from the Medical, Surgical, Obstetrical, and Pathological Sectional Councils respectively.

Meetings.

4. The Meetings shall be General and Ordinary.

Publication of "Transactions."

5. The "Transactions" shall be published by the Council, subject to the provisions hereinafter contained.

Original Fellows and Members.

6. All the Members of the present Societies (Medical, Surgical, Obstetrical, and Pathological) shall be Original Fellows or Members, without entrance fee, on payment of the annual subscription on or before 31st December, 1882.[a]

Fellows.

7. Fellows of the Royal College of Physicians of Ireland, and of the Royal College of Surgeons in Ireland, shall be admitted, without ballot, on payment of the entrance fee and the subscription for the current year. All others, being Registered Medical Practitioners not directly or indirectly engaged in the sale of drugs, shall be proposed by two Fellows, and elected by ballot by the Council.

8. Candidates shall be proposed at one Meeting of the Council, and balloted for at the next—one black bean in four to reject.

8A. That all Rules referring to the admission of Fellows, Members, and Student Associates shall be interpreted as referring to Ladies as well as Gentlemen.

Privileges of Fellows.

9. Fellows only shall be eligible for office in the Academy. They shall have the privilege of attending all Meetings of the Academy, of making Communications, and of voting and speaking at such meetings. They shall also receive a copy of the "Transactions."

[a] Those who have paid a Life Subscription to any of the above Societies will be admitted to the privilege of Fellows on payment of Member's subscription.

10. These privileges shall not be exercised by any Fellow in arrear with his subscription.

Honorary Fellows.

11. Honorary Fellows, limited in number to 25, may be nominated by the Council, and elected, on motion at a General Meeting of the Academy by a majority of at least two-thirds of those present and voting.

Members.

12. Any Registered Medical Practitioner may be elected as a Member, the election to be conducted in the same manner as that of Fellows.

Privileges of Members.

13. Members shall have the privilege of attending the Ordinary Meetings of the Academy, of making Communications, and of taking part in debate. They can purchase the "Transactions" at cost price.

Student Associates.

14. Registered Medical Students may be elected Student Associates for the period of one year. The Subscription must be paid before election, and the Council may elect without notice of motion.

15. Student Associates shall have the privilege of attending the Ordinary Meetings of the Academy.

Annual Subscription.

16. Fellows shall pay £2 2s., and Members £1 1s. Student Associates shall pay 5s. The Subscription shall become due on the 1st of October in each year, and if the Subscription be not paid on or before the first Meeting in February, the defaulter shall cease to belong to the Academy, unless the delay shall be accounted for to the satisfaction of the Council. No Fellow shall vote at the Annual General Meeting who has not paid his subscription for the year. Registered Medical Practitioners not residing within 15 miles of Dublin are eligible as Fellows of the Academy on payment of the entrance fee, and an annual Subscription of £1 1s. Medical Officers on the active list of the Royal Navy and Army are eligible for election as "Temporary Fellows" of the Academy on payment of an annual Subscription of One Guinea. No Fellow who has not paid his Subscription shall vote for any Candidate for Office at the Annual General Meeting, nor can the name of any Fellow be received by the General Secretary for insertion on the ballot paper as a Candidate for Office unless his Subscription shall have been paid for the current year.

Entrance Fee.

17. After admission of Original Fellows, all Fellows shall pay an entrance fee of £1 1s.

Council.

18. The Council shall meet on the first Wednesday in the month throughout the Session, or oftener should they see occasion—five to form a quorum.

19. Notice of all Extraordinary Meetings shall be transmitted by the Secretary to every Member of the Council. The President or any five Members of Council may call an Extraordinary Meeting of the Council. The Council shall determine questions by vote, or by division if so demanded, the President having a casting vote only. Any regulation of the Council shall have the force of a law, until submitted to the next General Meeting. The Council shall have the power of filling up any vacancies which may occur in the list of Officers of the Academy, except that of President, before the Annual General Meeting. If a vacancy in the office of President should occur, the General Council shall summon a Special General Meeting of the Academy to fill such vacancy. (1888.)

Sectional Councils.

20. There shall be six Sectional Councils elected by the Annual General Meeting in October, termed respectively—the Medical, the Surgical, the Obstetrical, the Pathological, the State Medicine, and the Anatomical and Physiological Councils.

21. No Fellow shall be eligible as a candidate for election on more than two Sectional Councils, but no Fellow shall be eligible as a candidate for election on both the Medical and Surgical Sectional Councils. (1888.)

22. Each Sectional Council shall consist of the President of the Section and ten Members, one of whom shall act as Secretary to the Section ; except the State Medicine and Anatomical and Physiological Councils, which shall each consist of a President and six Members. (1888.)

Meetings of Sectional Councils.

23. Each Sectional Council shall meet on a fixed day at least one week before the Ordinary Meeting of their Section, three to form a quorum.

Powers.

24. Each Sectional Council shall have the power of making any such arrangements as it thinks necessary to carry on the work of the Ordinary Meetings which are under its charge, provided that such arrangements do not interfere with the general laws of the Academy ; and any Rules laid down by such Council shall have the force of laws at the Ordinary Meetings under its charge, until submitted to the General Council.

25. Each Sectional Council shall have the power of filling up any vacancies that may occur among its Members until the Annual General Meeting.

Committee of Reference.

26. The Council shall appoint a Committee of Reference, to report upon morbid growths and other specimens exhibited before the Academy ; of this Committee the Exhibitor shall, for the occasion, be a Member.

Officers.

27. A President, to be elected by the Annual General Meeting in October, and to hold office for three years.

28. The Presidents of the Colleges of Physicians and Surgeons for the time being shall be the Presidents of the Medical and Surgical Sections. The Presidents of the other Sections shall be elected by the Fellows at the Annual General Meeting, and shall hold office for two years. (1888.)

29. One General Secretary and Treasurer to be elected at the Annual General Meeting.

30. It is expedient that a fixed salary (of one hundred guineas) shall be paid yearly to the General Secretary in consideration of the fact that the editing of the "Transactions" is part of his duties.

31. One Honorary Secretary for Foreign Correspondence to be elected at the Annual General Meeting. (1888.)

32. The Councillors for each Section to be elected at the Annual General Meeting. Each Sectional Council shall elect two Members to act on the General Council, except in the case of the Sections of State Medicine and Anatomy and Physiology. (1888.)

33. Two Members in each Sectional Council shall retire annually, and be ineligible for re-election for one year, except in the Council of the Section of Anatomy and Physiology, in which only one shall retire. (1896.)

34. Six Secretaries, one for each Section, to be appointed by the Sectional Councils.

35. At all elections after the year 1882, any Fellow desirous of nominating a candidate for election shall, at least ten days before the Annual General Meeting, forward an application to the General Secretary to enter the name of such Fellow on the list of candidates for office, provided that the Fellow so nominated shall have consented to act. (1891.)

36. That all elections shall be by ballot, but Fellows residing more than 15 miles from Dublin, and those incapacitated by illness (to be certified), may record their votes by ballot papers, sent to the presiding officer in sealed envelopes provided for that purpose. (1896.)

37. That in all elections to the Sectional Councils there shall be affixed to the name of each candidate the number of meetings of that particular Section for the Council for which he is now a candidate that he has attended. (1898.)

Duties of Officers.

38. *The President* shall preside at the Annual and Special General Meetings and at General Council Meetings. In the absence of the President, the Chairman shall be appointed by the meeting. (1888.)

39. *The Presidents of Sections* shall preside at the Ordinary Meetings of the Academy, and shall also preside at the Sectional Council Meetings. In the absence of the President, the Chairman shall be appointed by the meeting. (1888.)

40. *The General Secretary* shall attend all General Meetings of the Academy and General Council. He shall take minutes of such meetings, to be read at the following meeting.

41. He shall receive and have charge of all papers intended for publication in the "Transactions" of the Academy, after they have been handed over to him by the Secretaries of the several Sections.

42. He shall, on receiving notice from the Secretary of a Section, send out to all the Members notices of the title or titles of the paper or papers for the next Ordinary Meeting, with the name or names of the authors, and, so far as possible, of the subjects for Exhibition, with the names of the Exhibitors.

43. He shall arrange for the Exhibition of specimens and the reading of papers, which are to be forwarded to the Academy by those who are absent, or are not members.

44. The General Secretary and Treasurer shall receive all moneys, and lodge the same in bank to the account of the Academy, and all cheques shall be signed by the Treasurer and one other Councillor.

45. The Accounts shall be audited by two Fellows, not Members of Council, to be appointed by the President at some meeting previous to the Annual Meeting.

Duties of Secretaries of Sections.

46. To attend the Meetings of the Council of the Section and the Ordinary Meetings of the Academy, under the management of said Council, and to take minutes at such meetings, to be read at the next following meeting of that Section.

47. To keep such papers as the Sectional Councils recommend for publication, for the purpose of handing them over to the General Secretary.

48. To inform the Secretary of the Committee of Reference of any specimens referred to that Committee, and to transfer the specimens to that Secretary.

49. To give notice to the General Secretary, one week previously to the meeting, of the titles of papers for the evening, the names of the authors, and, so far as possible, the objects for Exhibition, with the names of Exhibitors, so that the General Secretary may inform the Members.

Meetings.

50. The Annual General Meeting to take place on the second Friday in October, for the election of Officers and Members of Council, and for the general business of the Academy.

51. Due notice of the meeting shall be given by the Secretary to all Members at least three weeks previously. (1891.)

52. No motion involving a change of these Rules shall be brought before this meeting except one week's notice thereof shall have been given by the Secretary to each Member.

53. The President may—and shall forthwith, on receiving a requisition signed by seven Fellows, at any time—on giving one week's notice, summon a Special General Meeting, for the consideration of particular business, the nature of which must be specified in the letter of summons convening the meeting, and at such meeting no other business can be transacted. In the event of the President being unable, from any cause, or declining, to summon a Special General Meeting of the Academy, it shall be in the power of the General Council to summon such meeting. (1888.)

Ordinary Meetings.

54. The communications to be submitted to the Ordinary Meetings shall be grouped under the following heads :—Medicine, Surgery, Pathology, Obstetrics, State Medicine, and Anatomy and Physiology ; and the conduct of such meetings shall be in the hands of the several Sectional Councils, each Sectional Council to have the management of the Ordinary Meeting in rotation, as arranged by the General Council. (1888.)

55. The Ordinary Meetings shall be held on every Friday evening, from the last Friday in October until the last Friday in May, inclusive, at eight o'clock, except during the Christmas and Easter recesses.

56. All Fellows, Members, and Student Associates attending the meetings shall write their names in the attendance book.

57. Any Fellow or Member may introduce two Visitors by cards obtained from the Sectional Secretaries.

58. Officers of the Army or Navy Medical Departments shall, on presenting their cards, be admitted to the Ordinary Meetings of the Academy.

59. No communication shall exceed twenty minutes in its delivery, nor any speech thereon ten minutes, except by permission of the Chairman. No one shall speak twice upon the same communication, except the author, who has the right of reply.

60. A paper by any other than a Fellow or Member of the Academy shall not be read before the Academy unless the author of such a communication shall have obtained permission to do so from the Council of the Section before which the communication is proposed to be read. (1892.)

Ordinary Meetings.—Order of Business.

61. (1.) Chair to be taken at 8 30 p.m.

(2.) Chairman to read list of specimens, &c., exhibited by card, together with the names of the Exhibitors.

(3.) No Pathological Specimen shall be exhibited at any Section other than the Pathological and Obstetrical, except by card. This Exhibition shall not exclude any subsequent communication regarding it at the Pathological Section.

(4.) There shall be no Exhibition of Specimens by card in the Pathological Section.

(5.) Any member shall have liberty to exhibit any recent specimen at any of the meetings of the Obstetrical Section, provided it illustrates any question in gynæcology.

(6.) At the meetings of the Obstetrical Section recent specimens may be exhibited, and the President may invite discussion thereon, provided that such exhibition of specimens or discussion, if any, thereon, must terminate at 9 o'clock, p.m., but that, if necessary, they may be resumed after the papers for the evening have been read and discussed.

(7.) Chairman to ask if any member has any observations to make or motion to propose relative to any living specimen on the List of Exhibition.

(8.) Chairman to call upon the author of the first paper on the list to read his paper.

(9.) Chairman to call upon members to discuss the paper, or, at his discretion, to take any other paper or papers on the list relating to the subject, and have the discussion subsequently on all such papers collectively.

(10.) When the last paper has been discussed, the Chairman to ask if any member desires to speak upon any of the specimens exhibited by card.

(11.) After the discussion upon any specimen, the Exhibitor has the right of reply.

Regulations regarding the Exhibition of Specimens by Card.

62. (1.) Any member may exhibit by card at any Ordinary Meeting, except at the meeting of the Pathological Section. At the meetings of the Pathological all specimens must be presented and described *viva voce*, and debate may be invited thereon.

(2.) Notice shall, if possible, be given to the General Secretary, or the Secretary of the Section, on or before the previous Ordinary Meeting.

(3.) Specimens must be in the room at 7 45 on the night of Exhibition.

(4.) Specimens for Exhibition by card shall be open for inspection at 8 p.m.

(5.) A card, containing all particulars for publication, shall be placed with the Specimen. Cards for this purpose are to be obtained from the Secretary.

(6.) The Exhibitor should be present, and he shall furnish further details if asked for.

(7.) Every Exhibitor shall submit the Specimen or Specimens on view to the Committee of Reference, if the meeting so decide.

Exhibition of Pathological Specimens.

63. No lengthened reference to treatment shall be allowed upon any Specimen, except by the express permission of the Chairman. Whenever it has been agreed that a Specimen exhibited at a Sectional Meeting of the Royal Academy of Medicine in Ireland shall be sent to the Reference Committee to report thereon as to its nature, the Exhibitor is to retain the custody of the specimen until he shall be summoned to a meeting of said Committee to be convened by its Secretary, on an early day, when he will attend and submit it for examination. (1889.)

By-laws concerning "Transactions."

64. The "Transactions" shall consist of such Communications made to the Academy by or through Fellows or Members as may be deemed by the General Council suitable for publication; also, of discussions of importance or interest arising out of such Communications.

65. All Communications accepted by the Academy become the property of the Academy, but authors may also print their Communications, subsequent to the reading of the same before the Academy, in any publication in addition to the "Transactions." Papers shall be handed to the Secretary of the Section immediately after they have been read. (1891.)

66. The "Transactions" for the year shall be presented to all Fellows of the Academy who have paid their Annual Subscriptions.

67. The "Transactions" may be purchased by Members at cost price.

68. The Publication Committee of each Section shall meet not later than the Tuesday after each meeting of the Section, for the purpose of abstracting the proceedings—the abstract to be placed in the printer's hands on same evening, and forwarded to the editors of medical journals with the least possible delay. (1888.)

69. Contributors of papers may send their papers to the Academy printer early enough to allow of their being put in type before the meeting, provided the author be responsible for the cost of same should the General Council deem the communication not suitable for publication in the "Transactions."

70. That on the evening of the day of meeting of the Sectional Council, when the papers for the next meeting have been decided upon, a circular be sent to each contributor informing him :—

(1.) That he is expected to be ready or else take his place at the bottom of the list.

(2.) That he must have an abstract ready with his paper, otherwise he will be noted in the published proceedings in such form as the Publication Committee think fit.

71. The General Council is empowered to defray the expenses in whole or in part of any illustrations which it may consider advantageous to the elucidation of the papers published by the Academy.

72. An abstract (prepared by the author) of each communication made at the Academy, along with a report of the discussions thereon, shall be furnished to the editors of such medical journals as may desire to publish them, and the authors of such communications shall be empowered to publish their papers *in extenso* in any periodical or periodicals they may think fit, such communications also to appear in the "Transactions," provided the Council consider them worthy of insertion.

Expulsion of Fellow or Member.

73. Expulsion of a Fellow or Member can take place only at a General Meeting of the Academy, on the motion of the Council, if two-thirds of the Members present shall vote for the same by ballot. Of such ballot the Council must give at least fourteen days' notice in writing to every Fellow of the Academy.

New Laws.

74. New Laws, or alterations in existing Laws, can be proposed only at the Annual General Meeting. Any Fellow proposing such alteration shall give notice to the General Secretary at least ten days before the General Meeting in October.

REPORT.

THE General Council reports that the number of Fellows for the Session 1902-3 was 232, of Members 31, and of Student Associates 12. The Fellows decreased by 5, the Members by 4, and the Student Associates by 3.

Notwithstanding this falling off in the number of Subscribers and a corresponding reduction in the amount of subscriptions the financial condition of the Academy compares favourably with that of the last annual report. The receipts are less by £21 1s. 0d., but the expenditure is less by £87 13s. 0d., so that the overdraft on the National Bank has been reduced from £81 19s. 6d. to £25 18s. 3d. The saving has been effected principally in the items of Reporters and Illustrations, and is due to the action of the Finance Committee, which was appointed by the Council in accordance with the resolution passed at the last General Meeting.

With this Committee the Council associated a second Committee to report on the whole question of the printing and reporting for the Academy. In consequence of the report of this conjoint Committee the Council abandoned the employment of shorthand reporters, and reverted to the practice formerly in operation of requesting each speaker to write at the time a short abstract of the observations made at the evening meetings.

On the recommendation also of this Committee the Council has made a contract with Messrs. Browne & Nolan

for the printing for the Academy, which is expected to effect a considerable economy in the annual expenditure.

On the visit of His Majesty King Edward to Dublin this year the Council presented an Address on the part of the Academy, which His Majesty graciously accepted.

The Council records with regret the loss the Academy has sustained by the death of Henry Gray Croly, one of the original Fellows, and who was formerly President of the Surgical Section.

General Treasurer's Report for the Session 1902–1903.

RECEIPTS.

	£	s.	d.
To Subscriptions and Entrance Fees -	473	8	0
,, Dividends - - - - -	18	19	4
,, Overdraft on Bank - - -	25	18	3
Total - - - -	£518	5	7

EXPENDITURE.

	£	s.	d.
By Balance due to Bank - - -	81	19	6
,, General Secretary - - -	105	0	0
,, Printing, Stationery, and Postage -	76	16	3
,, Transactions, Vol. XX. - - -	158	19	6
,, Illustrations, Vol. XX. - - -	21	8	6
,, Royal College of Surgeons - - -	15	15	0
,, Royal College of Physicians - -	15	15	0
,, Reporters - - - - -	4	4	0
,, Servants - - - - -	20	10	0
,, Groceries and Milk - - -	13	7	10
,, Lantern - - - - -	2	3	0
,, Address to the King - - -	2	2	0
,, Interest on Account - - -	0	5	0
Total - -	£518	5	7

We have examined the Accounts and Vouchers, and certify the same to be correct.

3rd October, 1903.

{ARTHUR H. BENSON,
{J. LUMSDEN.

The Capital is invested in the names of Sir GEORGE DUFFEY, Sir WILLIAM THOMSON, and Dr. WALTER G. SMITH.

Volume XXI. of the "Transactions" has been forwarded to the following:—

IRELAND:—

Medical Press	Dublin.
National Library	Do.
Royal College of Physicians	Do.
Royal College of Surgeons	Do.
Royal Irish Academy	Do.
Royal Dublin Society	Do.
Royal University	Do.
Trinity College	Do.
Queen's College	Belfast.
Do.	Cork.
Do.	Galway.

ENGLAND:—

Birmingham Medical Review	Birmingham.
Medical Institute	Do.
Bristol Medico-Chirurgical Journal	Bristol.
Liverpool Medico-Chirurgical Journal	Liverpool.
British Medical Journal	London.
Jenner Institute of Preventive Medicine	Do.
Journal of Obstetrics and Gynæcology, 65 Long Acre, W.C.	Do.
King's College	Do.
Lancet	Do.
Library, British Medical Journal, 429 Strand	Do.
Medical Magazine	Do.
Medical Review (Med. & Surg. Review of Reviews)	Do.
Royal Medical Chirurgical Society	Do.
Royal College of Physicians	Do.
Royal College of Surgeons	Do.
University	Do.
University College	Do
Victoria University	Manchester.
Durham College of Medicine	Newcastle-on-Tyne.
Quarterly Medical Journal, 342 Glossop Road	Sheffield.
Official Year Book of Scientific Societies.	

SCOTLAND:—

University	Aberdeen.
University College	Dundee.
Royal College of Physicians	Edinburgh
Royal College of Surgeons	Do.
University	Do.
Faculty of Physicians and Surgeons	Glasgow.
University	Do.
Do.	St. Andrews.

EUROPE:—

University	Amsterdam.
Naturforschende Gesellschaft	Basel.
University Library	Berlin.
University College	Bologna.
Académie Royale de Médecine de Belgique	Brussels.
L'Année Chirurgicale	Do.
Société Belge de Chirurgie	Do.

EUROPE—*con.*—

Université Libre	Brussels.
University College	Christiania.
Académie de Médecine	Copenhagen.
Finska Läkaregälls Kepet	Helsingfors
La Grèce Medicale, Syra	Greece.
University College	Madrid.
Archivio di Ortopedia	Milan.
Académie de Médecine	Paris.
Archives Orientales	Do.
Revue de Chirurgie	Do.
University of Paris	Do.
Imperial University	St. Petersburg.
Royal Carolinska Med. Chir. Institution	Stockholm.
Imperial University Library	Strassburg.
Archivie Italiano di Otologia	Turin.
Medical Society, Royal University	Upsala.
University	Vienna.
Naturforschende Gesellschaft, Dr. Rudolf Martin, Seefeldstrasse 119	Zurich.

AMERICA :—

Johns Hopkins University	Baltimore.
Journal of Medical Research	Boston, Mass.
Brooklyn Medical Journal	Brooklyn.
Magill University	Montreal
Academy of Medicine, 17 West 43rd Street	New York.
New York Medical Journal, 66 West Broadway [Exchange Discontinued]	Do.
University	Do.
Journal of Mental Pathology	Do.
Medical Brief	St. Louis, Mo.
American Journal of the Medical Sciences	Philadelphia.
Association of American Physicians	Do.
College of Physicians	Do.
University of Pennsylvania	Do.
University College	Quebec.
University Lavel	Do.
University of Toronto	Toronto.
Charlotte Medical Journal, Charlotte, N. C.	United States.
Library, Surg.-General's Office, Washington	Do.
Journal of Comparative Neurology, Denison University, Granville, Ohio	Do.
Medical Library Association, 19th and Stout Streets, Denver, Colorado	Do.

AUSTRALASIA :—

University	Adelaide.
Do.	Auckland.
Do.	Melbourne.
Inter-Colonial Medical Journal	Do.
University of Otago	New Zealand.
The Australasian Medical Gazette,	Sydney, N.S.W
University of Sydney, care of Young J. Pentland, 38 West Smithfield, London, E.C.	Do.

ASIA :—

Bombay University	Bombay.
University	Calcutta.
Imperial University Library	Tokio, Japan.

FEB 9 1955

TRANSACTIONS

OF THE

ROYAL ACADEMY OF MEDICINE IN IRELAND.

SECTION OF MEDICINE.

THE TREATMENT OF ENTERIC FEVER.

By SIR JOHN W. MOORE, M.D., D.P.H., B.A. (Univ. Dubl.), F.R.C.P.I.

Physician to the Meath Hospital and County Dublin Infirmary.

[Read in the Section of Medicine, November 20, 1903.]

"*Sed quod præ cæteris animadverto, in nullo morborum genere, tantâ opus est patientiâ, expectatione, cunctatione-que, ad bene et feliciter medendum, tanquam ad bene curandum febres mesentericas.*" So wrote the Italian physician, Georgio Baglivi,[a] towards the close of the seventeenth century. His words are true for all time, and apply with special force to typhoid or enteric fever, for there is no other disease which so taxes to the uttermost the resources of the physician. Of every "turn" in enteric fever, of every day or hour which marks its course, it may truly be said: "*Latet anguis in herba.*" The attitude of the physician must day by day be one of "armed expectancy"—to borrow an expressive phrase given by Dujardin-Beaumetz in 1889 to that form of symptomatic treatment which has also b n called "the medication of indications."

In this paper I propose to touch briefly on only a few

[a] Opera Omnia. Rome, 1696. Ed. Sext. Lugduni, 1704, page 54.

points which have made a fixed impression upon my mind as a result of an experience extending over many years.

I.—THE SANITARY HOUSING OF THE PATIENT.

Enteric fever should never be treated in a house with defective, leaking drains, or in which the water-supply is open to the suspicion of being the source of the original poisoning. No other specific fever, perhaps, requires such close attention to the sanitary surroundings of the patient smitten with the disease. Nothing is more striking than the marvellous improvement which often follows an enteric fever patient's removal from the tainted atmosphere of a sewage-reeking dwelling to the airy, well-warmed, wholesome ward of a hospital. In the insanitary home, the patient lies day after day inhaling or swallowing repeated doses of the fever-poison. But, what is still more important, his vital powers are impaired by breathing stale and septic air, and so he goes under in the battle.

On September 30, 1903, I was called to see C. M., a fine, tall young man, aged twenty-seven, who was lying ill in an old, badly-drained house in Aungier-street, Dublin. He was on the 9th day of a well-marked attack of enteric fever. The axillary temperature was 103.2° F. There was considerable enlargement of the spleen, and a very few rose-spots were found on the chest and abdomen. He was removed on the next day (October) to the Epidemic Wing of the Meath Hospital. On admission he looked heavy and profoundly ill. The pulse-rate was only 92, but the respirations were 26, without any pulmonary trouble to account for the rapid breathing. The temperature was already falling, and continued to do so for eight days, when, on the 18th day of the attack, it became subnormal in the evening as well as in the morning. On October 16th (the 25th day) the Widal test gave a decided and positive reaction in a

dilution of 1 in 40. C. M. continued to progress most favourably and was apparently convalescent when, on Saturday, October 24th, he had a "chill" followed by headache, the axillary temperature rising to 100° in the evening. Next day a maximum of 102° was reached, and on Monday, October 26th, the average temperature was 102°, the range being only from 101.6° in the morning to 102.4° in the evening. A very few fresh rose-spots made their appearance on Wednesday, October 28th, when also the spleen was found to be enlarged. In a word, a true relapse had set in. It ran an even and uncomplicated course of 19 days, the temperature chart presenting marked morning remissions and evening exacerbations, and in general a typical example of defervescence by lysis.

One could not help attributing the rapid improvement in this man's state to his timely removal from an unhealthy dwelling-house to a clean and well-ventilated ward in the hospital. For the relapse it is difficult to account, since the circumstances remained unchanged. The absence of abdominal symptoms would suggest that the case was possibly one of "spleno-typhoid," a form of the disease in which, perhaps, secondary infection may be caused by the discharge into the circulation of tainted blood hitherto stored up in the engorged spleen.

II.—THE RELATION OF DIARRHŒA TO EARLY PURGATION.

Diarrhœa is too often accepted without question as one of the most constant symptoms of enteric fever. According to Murchison, diarrhœa was present in 93 out of 100 cases observed by him. There can be no doubt that the severity and danger of this form of fever are closely related to the intensity of the diarrhœa, understanding by the term not only frequent, but also copious, evacuations. On the other hand, the bowels are often even obstinately constipated,

and sometimes this is by no means a favourable indication. A tendency to constipation has of late years been observed in a majority of the enteric fever patients treated in the epidemic wing of the Meath Hospital, and the treatment of this condition often taxes the physician's ingenuity to the uttermost. To this subject I will afterwards refer in more detail.

But what I want to emphasise just now is the fact that in many instances troublesome diarrhœa is started by routine and unreflecting purgation at the beginning of the fever. For this bad practice the patient is frequently, the physician is occasionally, to blame. The onset of enteric fever is often mistaken for a mere "bilious attack." An aperient pill is taken, followed by a brisk saline cathartic. The bowels act freely, and continue to do so day after day. When a physician is called in to attend a "bilious attack" in a previously healthy individual, he should not lose sight of the possibility of enteric fever. Careful observations on the temperature, particularly in the afternoon or evening, will aid in the diagnosis. It is of course desirable that the intestinal tract should be swept and cleansed at the outset of enteric fever, but the process must be carried out with extreme caution, and all strong purgation should be "shunned like the plague"—to borrow Georgio Baglivi's expressive phrase.

III.—ANTIPYRESIS GENERALLY UNCALLED FOR.

Any physician who has had extensive experience of enteric fever must agree with Professor Arnaldo Cantani,[a] of Naples, in looking upon fever or "pyrexia" in the light of a general or essential, and—within definite limits—a beneficial reaction of the organism to changes in metabo-

[a] "Ueber Antipyrese." Transactions of the Tenth International Medical Congress. Berlin. 1890. Vol. I. Page 152.

lism and in the blood, due to the causative agent of the disease. This reaction is necessary to bring about cure, and pyrexia may be useful towards this end, so long as tissue-consumption does not rise to exhaustion, and the heart-muscle or the nervous system does not suffer from hyperpyrexia. Viewing the fever-process in this light, German writers now often speak of what they aptly call, "*das Heil-Fieber.*" Cantani himself quotes Boerhaave's question and answer—"*Quid est febris? Est Naturæ irritatæ conamen ad expellandum stimulum inconsuetum,*" as well as Borsieri's words—"*Quos interdum morbos remedia non curant, febris curat.*"

If we adopt this interpretation of the fever-process—and who can doubt its truth?—let us beware how we meddle with pyrexia in enteric fever. I am convinced that the wholesale exhibition of the fashionable anti-pyretics of the present day—acetanilid, phenacetin, phenazone, and so on—is fraught with risk. They open the floodgates of heat-discharge (thermolysis), while they seriously interfere with heat production (thermogenesis), and so dangerous collapse is induced. These drugs, of course, may serve a useful purpose, when administered in small or moderate doses, in the treatment of enteric fever. They assuage the toxæmic rheumatoid pains of the disease, and so allay cerebral excitement and invite sleep. This is a great gain to the fever-stricken patient. But pushed so as to reduce temperature, they imperil life.

In the "water treatment" alone have we a safe and certain means of controlling or even reducing body-temperature in the febrile state. It is necessary here only to enumerate the various ways in which this method of treatment may be carried into effect:—

1. *Tepid sponging*, or mopping the surface of the body with a sponge squeezed out of tepid or warm water. This

is usually grateful and refreshing to the patient, and reduces the surface-temperature from 1.5° to 2° F. It stimulates the cutaneous circulation, and so promotes general antipyresis. I was curious to find out whether the reduction of temperature after tepid sponging was merely a local surface effect, or whether evidence was forthcoming of a general constitutional defervescence. To test the matter, I had a series of observations made in the mouth under the supervision of the Staff-Sister in charge of the epidemic wards of the Meath Hospital. Invariably the temperature fell in the mouth, as well as in the axilla, some 1.5° to 2°.

2. The *wet-pack*, as recommended and practised by Brand of Stettin.—Dr. Sydney Ringer advocates a modification of this method—namely, the continued application, from the chest downwards, of cloths wet with ice-cold water and wrung nearly dry. These are effectual means of reducing temperature with perfect safety.

3. *Immersion in cold baths* (temperature of the bath 70° to 50° F.) is practised on the Continent, and particularly in typhoid fever, unless intestinal hæmorrhage threatens or is taking place. A prudent modification of this method was suggested many years ago by von Ziemssen—the initial temperature of the bath should be only some 10° below that of the body, but after the patient's immersion the bath should be gradually cooled down to 68° F. by adding cold water.

4. The *ice-cradle*, introduced by Dr. Samuel Fenwick at the London Hospital, has been used there for many years with satisfactory results.

5. In 1787 *cold affusion* was proposed by Dr. Currie, of Liverpool, both for arresting and for mitigating continued fevers.

6. The *ingestion of small quantities of cold water* at

frequent intervals. Taken internally, as I have pointed out elsewhere,[a] water is the most effectual assuager of consuming thirst, the best and safest diuretic, diaphoretic, aperient, and eliminative we can prescribe. Cold water, sipped frequently, often allays delirium and induces sleep, in this way acting indirectly, as well as directly, as an antipyretic. Dr. H. C. Wood, in 1888, showed[b] that "while we cannot by water produce tissue-disintegration, we can by it wash out the retained products of tissue-change."

7. The *injection into the rectum* of small quantities of cold water will not only reduce temperature, but also overcome constipation during the earlier stages of enteric fever. In the sloughing stage of the "typhoid ulcer" the use of warm water enemata is safer, as they do not excite peristalsis when exhibited at blood-heat.

Akin to the water treatment of pyrexia is the method of reducing bodily temperature in fever, and especially in enteric fever, by means of the *ambient air*. Dr. A. de Souza communicated a paper on this subject to *El Monitor Medico* for September, 1886. In winter he would keep the sick-chamber at a temperature of from 8° to 10° C. (46.4° to 50° F.), the only bed-covering being a sheet and one blanket. Something extra is thrown over the feet towards dawn, should the temperature of the sick-room or of the patient fall considerably. In summer much may be done by proper ventilation and light bed-clothes.

In exceptional cases, quinine in full doses—5 or even 10 grains repeated at short intervals, until from 20 to 40 grains have been taken—is a favourite antipyretic, especially with German physicians. I have myself occasionally used it in this way, particularly in the later stages of the fever, when it assumes a remittent type. If the patient is

[a] Eruptive and Continued Fevers. Dublin: Fannin & Co. 1892. P. 10.
[b] Therapeutics: its Principles and Practice.

conscious and can swallow a cachet, this is the handiest way of giving the drug; or it may be exhibited, together with 3 or 5 grains of powdered camphor, in milk.

Should persistent high temperature go hand in hand with wakefulness—a condition which itself increases feverishness—a hypodermic injection of morphin ($\frac{1}{8}$ to $\frac{1}{6}$ grain), strychnin ($\frac{1}{30}$ grain), and digitalin ($\frac{1}{100}$ grain) often invites sleep and lowers temperature.

IV.—MANAGEMENT OF THE BOWELS, AND INTESTINAL ANTISEPSIS.

The treatment of constipation in enteric fever is, to my mind, more difficulf than the control of diarrhœa. Allusion has already been made to the necessity for opening the bowels with caution in the early stages of the fever. This object is best achieved by a small dose—1 to 3 grains, or even only half a grain—of calomel given at bedtime, and followed next morning by $7\frac{1}{2}$ grains of salicylate of sodium, with a drachm of effervescent citrate of caffein in water; or a simple enema may be administered. Later on, and after the eighth day, calomel seems to be contra-indicated, and had better be withheld, because of its power to increase peristalsis. The safest and best aperient then is castor oil given in teaspoonful doses with glycerine (1 fluid drachm) and 2 ounces of milk—this dose being repeated at intervals of six hours until the bowels act regularly. An alternative would be tablespoonful doses of the "Mistura Olei Ricini" of the British Pharmacopœia of 1898.

Another mild and pleasant aperient is a flipped banana. It is easily prepared. A sound banana is peeled, placed in a small bowl or breakfast cup, crushed with a fork, and then whipped like an egg. Its cells are in this way broken, and a sweet, creamy emulsion is formed. Taken in the early morning, a flipped banana is an effective, yet gentle, laxative, and may safely be given at any stage of enteric

fever. A glycerine compress applied over the abdomen also helps in the treatment of constipation, and checks meteorism or tympanites—that ominous and dangerous symptom—or the bowels may be kept moving by a simple, or a turpentine, enema as required. When diarrhœa is present, diet should be revised. Beef-tea should be stopped, as well as strained mutton broth. Chicken broth may be thickened with a little isinglass, arrowroot, or Groult's tapioca. Milk should be boiled, and, when cold, given with one-fourth to one-half its bulk of lime-water, or an equivalent proportion of saccharated solution of lime; or peptonised milk may be substituted; or, better still, equal parts of white-wine whey and egg-water (*i.e.*, the whites of 2 eggs beaten to a foam and mixed with a pint of cold water and strained).

As to medicines, we may employ freshly-prepared chalk-mixture, to each half-ounce dose of which may be added 10 minims of the compound tincture of chloroform of the British Pharmacopœia of 1885, or—if the patient is in pain—a like quantity of tincture of chloroform and morphin. Half-an-ounce of the following mixture after each motion also soon checks diarrhœa, namely:—

℞. Tincturæ chloroformi et morphinæ compositæ,
Glycerini acidi carbolici, āā - - ʒij
Aquæ menthæ piperitæ (vel cinnamomi), ad ʒvj
M. Ft. mistura.

Salicylate of bismuth is an excellent remedy in the septic diarrhœa of the sloughing stage, and at any period in the fever small doses (10 minims) of turpentine given systematically every few hours control both diarrhœa and tympanites in a remarkable and most satisfactory fashion.

In this connection, let me recall a "Note on Salicylate of Quinine" which I communicated to the *Practitioner* for January, 1903. In enteric fever this drug seems to me

to be far superior to salol or any of the other so-called intestinal disinfectants, the invaluable salicylate of bismuth not excepted. Given early in the disease—perhaps after a moderate dose of calomel has scavenged and disinfected the intestinal canal—and continued throughout the fever-movement or even into convalescence, quinine salicylate has appeared to regulate the bowels, correct the fœtor of the evacuations, check tympanites, and control any tendency to vesical catarrh. Under this treatment, the fever has apparently run a mild and favourable course, the more serious complications of its later stages failing to appear, save in rare instances. It may be given in 3-grain tablets or in 5-grain doses in cachets. Occasionally symptoms of quinism have obliged us to stop the drug.

The last drug which I will mention is turpentine. It fulfils many indications in enteric fever. Not only is it an excellent diffusible stimulant and a valuable antiseptic, but it also relieves chest-complications, controls diarrhœa, checks meteorism, and stays intestinal hæmorrhage. Turpentine is, therefore, one of the best all-round remedies we possess for the treatment of enteric fever. It is conveniently prescribed in capsules or perles containing 5 or 10 minims of either turpentine or terebene. Another good way of prescribing it is with spirit of nitrous ether as follows:—

℞. Spiritûs terebinthinæ - - - ℥ij
Spiritûs ætheris nitrosi - - - ℥ij
Spiritûs chloroformi - - - ℥ij
Misturæ amygdalæ, ad - - - ℥vi
M. Ft. mistura. Signa: shake the bottle. Half an ounce for a dose.

Caution is necessary in the exhibition of turpentine in the presence of albuminuria, or when there is disease of the kidneys or bladder.

V.—INTESTINAL HÆMORRHAGE.

While it is always an alarming symptom, intestinal hæmorrhage is by no means necessarily followed by grave results. I have seen many cases of profuse intestinal hæmorrhage in enteric fever, and the impression left upon my mind is that an unexpected and surprising improvement in the patient's state sometimes follows a single copious bleeding, whereas repeated bleedings of less amount nearly always end in death. Should blood pass from the bowels in the third or fourth week, we naturally regard the symptom as a danger-signal, a warning of impending perforation; for the source of the hæmorrhage at that stage of enteric fever is almost certainly the blood-vessels running beneath the transverse muscular fibres of the intestine.

All authorities agree that the first and chief indication in intestinal hæmorrhage is *absolute rest.* This is secured by withholding food for several hours, or by giving only small quantities of whey and egg-water, and by the free exhibition of opium, preferably in the form of hypodermic injections of morphin. Ice may be sucked, and an ice-poultice, or a bladder containing broken pieces of ice, may be laid over the right side of the abdomen, as recommended by Murchison. The same excellent authority found the following mixture almost invariably effectual for stopping the bleeding:—

℞. Acidi tannici, gr. 10;
Tincturæ opii, min. x;
Spiritûs terebinthinæ, min. xv;
Mucilaginis acaciæ, ʒij;
Tinct. chloroformi comp., min. xx;
Aquæ menthæ piperitæ, ad ʒj.

ℳ. Ft. haustus, secundâ quâque horâ sumendus.

I suggest that from 10 to 15 or even 20 minims of the

compound tincture of chloroform and morphin of the British Pharmacopœia of 1898 should take the place of the laudanum and compound tincture of chloroform in the above prescription.

When the hæmorrhage is so profuse or continuous as to endanger life, we may adopt von Ziemssen's recommendation of ice-water enemata and rectal injections of blood or of salt water. In such cases, also, twenty-grain doses of chloride of calcium every few hours will do good, or adrenalin or cornutin (Kobert) may be exhibited. The last-named is a powerful hæmostatic, but is said to raise blood-pressure. The dose is one-sixth to a quarter of a grain daily, given in divided doses. The hydrochloride of cornutin is more soluble than the alkaloid itself, while the dose is the same.

VI.—PERFORATION.

The treatment of this deadly complication of enteric fever is at best a forlorn hope. "Pin-hole" perforation naturally gives the patient a better chance of life than rupture properly so called, when a ragged rent or tear at the excavated base of an ulcerated Peyer's patch that has sloughed allows a wholesale extravasation of the septic bowel-contents into the peritoneum.

Of late years interest has centred in the surgical treatment of perforation. I am indebted to my colleague, Mr. William Taylor, F.R.C.S.I., for the following abstract account of his personal experience in intestinal perforation at Cork-street Fever Hospital and at the Meath Hospital and County Dublin Infirmary. The cases are five in number:—

Case I.—Mrs. C., aged about thirty-seven years, was admitted into Cork-street Fever Hospital early in July, 1899, suffering from typhoid fever. She had had an abortion about three weeks

prior to admission. Her attack was a severe one. Symptoms of intestinal obstruction developed during convalescence, for which the abdomen had to be opened on August 19. The condition found was a suppurating right ovary, and three localised deposits of pus in the mesentery from softening mesenteric glands. Relapse of the typhoid followed, with severe diarrhœa. On September 4 severe pain in the abdomen and vomiting again set in, with increasing rapidity of the pulse. Operation about eight hours later disclosed a perforation through the floor of a typhoid ulcer. This was closed with a single row of sutures. Death occurred fifteen days afterwards from fresh perforation. The necropsy showed that the sutured ulcer was healed.

Case II.—P. C., a man, aged fifty-two years, was admitted into the Meath Hospital under Dr. Lennon on June 11, 1901. He had been working as a cobbler until the day before admission; and, though feeling unwell for a fortnight before this, he ate a chop, some peas and potatoes, on the day before admission. Rose-spots were present. At 9 p.m. on the night after admission he complained of severe pain in the abdomen, which was followed by vomiting. When Dr. Lennon saw him the next morning, he diagnosticated perforation. Operation was performed at 12 noon, about fifteen hours after the onset of the pain. A perforation was found about 15 to 20 inches above the cæcum. This was closed with a purse-string suture, reinforced by a continuous Lembert suture. The abdomen was full of pus, and was washed out; and the wound was closed, a small gauze drain being left leading down to the sutured intestine. Death occurred about ten or eleven hours later.

Case III.—E. D., a woman, aged twenty-eight, a very bad syphilitic subject, was admitted into Cork-street Hospital on December 31, 1902. She had been ill for about two weeks. She went to the North Dublin Union owing to the onset of severe pain in the abdomen and vomiting on the morning of December 31, and was sent from that Institution to the Lock Hospital. From the latter she was sent to Cork-street, where she arrived late in the evening. She was seen by Mr. Taylor, after a telephoned message, on January 1, about 2 p.m. General peritonitis was evidently present; he thought it might be the result of appen-

dicitis. Operation was performed at 3 p.m. The abdomen was full of pus. A perforation of a typhoid ulcer was found about six inches from the cæcum. The opening was closed by a purse-string suture. The belly-cavity was irrigated and cleansed, and the wound closed, a tampon being placed in the pelvis and right iliac fossa. Anti-streptococcic serum was given. Death took place about 51 hours later. At the necropsy there was found extensive ulceration of the intestine: there was no fresh accumulation of pus, or evidence of further peritonitis.

Case IV.—J. H., a man, aged twenty-one years, was admitted into Cork-street Hospital on August 4, 1903, suffering from a severe attack of enteric fever. He had been ill for 12 days prior to admission. Symptoms of perforation were observed at 9 a.m. on the 6th. He was seen by Mr. Taylor at 3 p.m., his pulse was then 150 per minute, and very feeble. It seemed doubtful whether he could stand an operation, but at 3 30 the abdomen was opened, to give him a chance, under ether. A small perforation was found, 16 to 18 inches from the cæcum. This was closed by a purse-string suture, reinforced by a continuous Lembert. A second ulcer was just about to perforate, about 12 to 14 inches higher up; this was infolded by a purse-string suture. The abdomen, which was full of thin pus, was freely irrigated with saline solution, and the wound was closed without drainage. The operation lasted only 21 minutes. Except that the edges of the wound suppurated, the patient had no bad symptoms. His temperature remained normal after the first week, and he rapidly recovered. When completely convalescent, five weeks after the operation, this patient developed acute intestinal obstruction. He was seen by Mr. Taylor on the fourth day, and the abdomen was opened. There were extensive adhesions of the intestines to one another all over the abdomen. These were separated, the contents of the gut were evacuated, and the abdomen was closed. Death took place about 12 hours later. The necropsy showed complete healing of both the ulcers which had been sutured; the mucous membrane completely covered them in, and the only evidence of their sites consisted in the lines of silk sutures outside.

Case V.—F. B., a boy, aged twelve years, was admitted into

Cork-street Hospital on August 21, 1903. He had been ill for nine days before admission, and when seen was delirious, and suffering from a very severe attack. On September 15 at 9 p.m. he complained of pains in the abdomen, which was followed by vomiting. He was seen by Mr. Taylor for the first time at 1 45 a.m. on the 17th, 28½ hours after the onset of the pain. The abdomen was opened at 2 a.m. General peritonitis was found, the abdomen being full of pus; and a perforation was discovered in the appendix vermiformis. This was removed. Free irrigation was employed, and the abdomen was closed, a tampon being placed in the pelvis and a second in the right iliac region. Death occurred at 10 30 p.m. on the 18th—that is, about 44 hours after operation.

VII.—DIET IN THE CLOSING STAGES OF THE FEVER.

All physicians will agree that the management of the convalescent enteric fever patient in regard to diet is one of the most difficult problems in the whole range of the practice of medicine. "No solid food," said the late Dr. Hilton Fagge, "should be given for a fortnight after fever and diarrhœa have ceased. The patient will bitterly complain of the restriction; but if the physician has once lost a patient from perforation during convalescence, he will be inexorable ever after. Progress to health after this disease must be slow if it is to be sure."

"Notwithstanding the cravings of the patient's appetite," wrote Charles Murchison, "the diet must be at first restricted to such articles as milk, eggs, farinacea, custards, light puddings, beef-tea, chicken-tea, or calf's-foot jelly. Meat ought not to be allowed for at least seven days after the cessation of pyrexia, and not even then if there be any signs of intestinal disturbance; and before meat is given it is well to try for a day or two a piece of boiled sole, smelt, or whiting."

Even fish, however, does not always agree with a convalescent from enteric fever. It sometimes appears to pro-

duce poisonous effects, although apparently in good condition. I have known this to occur in more than one case, the fish eaten being a fresh sole, to all appearance perfectly sound.

In a case observed at the beginning of the present session, a very sparing meal of chicken on the forty-eighth day of the fever led to a rise of temperature to 102° F., abdominal pain, and the passage of motions containing small lumps of undigested chicken-flesh. The patient had not been entirely fever-free when she partook of the meal which so thoroughly disagreed with her, for her evening temperatures for six nights previously had been on the average 100.1°.

"Convalescents from typhoid fever," says William Osler, "frequently cause greater anxiety than patients in the attack. The question of food has to be met at once, as the patient acquires a ravenous appetite and clamours for a fuller diet. My custom has been not to allow solid food until the temperature has been normal for ten days. This is, I think, a safe rule, leaning, perhaps, to the side of extreme caution; but, after all, with eggs, milk toast, milk puddings, and jellies, the patient can take a fairly varied diet." Osler had "a lesson," as he himself says, in this matter which he has never forgotten. A young lad in the Montreal General Hospital passed through a tolerably sharp attack of enteric fever. Two weeks after the evening temperature had been normal, and only a day or two before his intended discharge he ate several mutton chops. Within twenty-four hours he was in a state of collapse from perforation. A small transverse rent was found at the bottom of an ulcer which was in process of healing.

A very pressing—though happily a rare—danger in convalescence is heart-failure, due to peripheral neuritis, as in diphtheria, or to hyaline degeneration of the cardiac

muscle, as in typhus. Strychnin, especially when administered hypodermically, is a sheet anchor in this emergency. The patients also must be kept in the recumbent posture. If they must needs get out of bed to the night-chair, a teaspoonful of whisky or brandy with three teaspoonfuls of warm water should first be given. Nor should they be left alone for an instant. It is in such circumstances that embolic infarction of the mesentery is likely to occur—an accident which is quickly followed by necrosis or gangrene of the intestine, paralytic arrest of peristalsis, and death.

In conclusion, may I claim the privilege of advancing years and a riper experience to warn young physicians against the perilous error of adopting a routine treatment of enteric fever, particularly in the matter of alcoholic stimulants. It is one thing to treat a disease, it is quite another thing to treat a patient suffering from that disease. As I have written elsewhere, "the attitude of the physician who is in attendance upon a patient in enteric fever should be that of watchful, intelligent, and armed expectancy."[a] I am of a truth convinced that great risk arises to many a fever patient from a fussy, nervous, over-zealous interference on the part of the physician. We should not forget that enteric fever is a self-limited disease, which in perhaps a majority of cases tends to run its appointed periodic course without mishap, the essential symptoms having "kept the noiseless tenor of their way." There is, in fact, no malady in which it is so desirable to avoid what has been well termed the "*nimia diligentia Medici.*"

[a] Eruptive and Continued Fevers. 1892. Page 449.

NOTES ON A CASE OF PERFORATION IN TYPHOID FEVER.

By HENRY C. DRURY, M.D., F.R.C.P.I.,
Physician to Sir Patrick Dun's Hospital,
Visiting Physician to Cork-street Fever Hospital, Dublin;

AND

WILLIAM TAYLOR, M.B., F.R.C.S.,
Surgeon to the Meath Hospital and County Dublin Infirmary,
Surgeon to Cork-street Fever Hospital.

[Read in the Section of Medicine, November 20, 1903.]

J. H., aged twenty-one, was admitted to Cork-street Fever Hospital on August 4th, 1903. He was an ambulatory case of typhoid fever, and in consequence we were unable to find out how long he had been ill, but from his own account we considered it was about his twelfth day of fever. In reality he had probably been ill three weeks or more.

He appeared to be quite a mild case, and when seen the morning after admission presented absolutely no bad symptoms. Though a light, spare subject his aspect was good. The abdomen was flat, the tongue moist and not very dirty. There were a few rhonchi in the lungs, the heart was sound, the bowels moving moderately, and the appearance of the motions satisfactory. His temperature was moderate, varying between 101.2 and 102.8 morning to evening; the pulse quiet—between 84 and 96. There was, therefore, no cause for alarm in his condition. However, the next morning—the second after admission—at 7 45 a.m., he complained of a severe pain in the abdomen. Dr. Sandes, one of the assistant resident medical officers of the hospital, saw him; the pulse was then quiet. I must acknowledge the splendid way in which Dr. Sandes looked after and managed the case throughout, for as the resident medical officer was away for his holidays, Dr. Sandes took the entire responsibility. At 9 o'clock, pain continuing and increasing, he was given ¼-gr. morphia hypodermically; the pulse was still quiet—under 100. At

about 12 o'clock, when I saw him, it had risen to 120; he had a drawn, anxious look, the abdomen was full and slightly distended; it was very tender on pressure, tympanitic, but liver dulness present. It was apparent that perforation had taken place. Mr. Wm. Taylor, the surgeon to the hospital, was asked to intervene. By the time Mr. Taylor could be got and was able to be at the hospital, it was 3 30 o'clock. Everything being in readiness, the operation was commenced seven and a half hours after the occurrence of perforation, but by this time the patient's condition had greatly changed for the worse, and the pulse-rate had risen to 150 or over.

MR. TAYLOR'S ACCOUNT OF OPERATION.

When seen by me at 3 30 p.m. the condition was most unpromising. The pulse was 150 to the minute, small, thready and irregular. The facies were typical of a peritoneal catastrophe. The respirations were over fifty a minute. The abdomen was distended, motionless, rigid, and tender all over. Though his condition was most unfavourable for operation, I considered myself morally bound to give him whatever chance surgery offered. The skin of the abdomen was quickly cleansed and the abdomen freely opened, under light ether anæsthesia, through the right rectus muscle. The intestines were allowed to prolapse into warm towels. The perforation, which was a small one, was easily found about fifteen to twenty inches from the ilio-cæcal junction. The opening was closed by enfolding it with a purse-string suture, over which a continuous Lembert suture of fine silk was placed. A second ulcer which seemed just about to perforate, some twelve or fourteen inches higher up, was also enfolded with a purse-string suture. While I was dealing with the intestines, my assistant, Dr. Sandes, was washing out the abdominal cavity with warm saline solution. Having then got the intestines free of the septic fibrin with which they were covered, and the general peritoneal cavity as thoroughly cleaned as the condition of the patient permitted, the intestines were returned, and the edges of the wound approximated by through-and-through sutures of silkworm gut. Several pints of warm saline solution were left in the abdominal cavity. The operation from start to finish occupied about twenty-one minutes, and the patient was returned to bed with a pulse of much the same rate as before we started.

DR. DRURY'S ACCOUNT—*continued.*

Subsequently great interest attaches to the struggle to keep the patient alive, and the very highest credit is due to Dr. Sandes and the nurses, by whose unremitting attention, day and night, success in this endeavour was attained. The measures used were nutrient enemata, saline enemata, hypodermic injections of morphia, strychnin and digitalin. The heart, which was flickering at the rate of 150, was thus kept going, and by the fourth day after the operation it had gradually strengthened in force and diminished in frequency to 100.

Owing to his enfeebled and febrile condition, together with the effect of the ether administered for anæsthesia, the lungs became greatly filled up with bronchitic fluid, and there were moist râles all over the chest. It was therefore necessary, in spite of the operation, to keep him constantly moved from one side to the other. His fever still continued at high range, but his general condition steadily, though gradually, improved. The lungs slowly cleared, the heart became stronger and less frequent in action, and at the end of a week after the operation the temperature reached and remained at normal—*i.e.*, nine days after admission, or seven days after operation.

On the removal of the stitches from the abdominal wound, which had apparently closed all right, it was found there was an abscess in the deeper part of the incision, due, no doubt, to its infection by the fæcal material which had escaped from the perforated bowel. The whole wound then suppurated and sloughed. By Dr. Sandes' constant attention this was got into a healthy condition and brought together without having infected the general peritoneal cavity. This suppuration was accompanied by a mild fever of hectic type, which came on about a week after the enteric fever had ended, and which lasted for another week. In spite of this he convalesced steadily, but, lest this fever should have any connection with his enteric, we were careful not to take any liberties with his diet, so it was not till this fever had ended—and fifteen days after what we considered as the enteric fever was over—that he was given some solid food in the shape of bread crumb. This agreed well, and very cautiously other additions were made, but nothing stronger than a lightly boiled egg had been given up to the beginning of September. It will be remembered he was admitted on August 4th.

On the evening of September 2nd, twenty-eight days after operation, he complained of pain in the abdomen. Nothing abnormal could be found except some tenderness all over the retracted abdomen. The pulse and temperature remained unchanged, and the bowels had moved twice naturally; there was slight emesis with retching, and the breathing was costal.

The next day pain was still complained of, but nothing fresh was made out, except that the abdomen was slightly fuller and the bowels had not moved.

On the third day the abdomen was decidedly fuller; there was still dull, continuous pain. One drachm of castor oil produced a very small motion, but there was no other relief.

On the fourth day there was still pain; the patient again looked wretchedly ill; the abdomen was manifestly distended. Up to this the pulse and temperature had remained normal, but now, though the temperature still remained normal, the pulse had risen to 116. The bowels had not moved. Mr. Taylor was again asked to see him, and while present an enema was given, which was returned unchanged. He at once resolved to open the abdomen again, and endeavour to undo the cause of obstruction.

FURTHER NOTES BY MR. TAYLOR.

Second Operation, 4½ weeks after suturing perforations.—When seen by me he presented all the appearance of acute intestinal obstruction. He was then vomiting, and complained of severe spasms of pain; the expression was anxious; the abdomen generally distended, and constipation was then absolute. An enema produced no effect. The abdomen was again opened, when the intestines were found extensively matted to each other and to the abdominal wall. With considerable difficulty, on account of the density of the adhesions, a separation was effected. The obstruction was evidently due to sharp angulation, the result of adhesions, as no distinct band was found producing constriction at any point. Two very distended coils were evacuated of their contents, and the abdominal wound again closed. The time occupied was about 40 minutes. Unfortunately the poor fellow never rallied, and sank about ten or twelve hours later.

This most unfortunate result is much to be deplored, for the operation Mr. Taylor performed during the course

of the fever was really successful; it prolonged the patient's life for four and a half weeks, and having been undertaken during the course of the fever, such a result is rare.

The *post-mortem* showed that the obstruction was in no sense due to the sutures in the gut. These completely closed the perforation, and there was no leakage. In fact, the only evidence we could get of the site of perforation was the presence of the silk sutures. Healing over the two sutured areas was perfect. Where precisely the obstruction occurred could not be seen, as the adhesions had been broken down at the second operation. But inside the bowel a most instructive and a most important observation, from a physician's point of view, was made—namely, that there were numerous large ulcers still present, in the process of healing it is true, but not by any means healed. They were variable in size, some large and surrounded by a raised margin. A very few appeared to have healed, but the majority were still open. That is, we found healing ulcers more than three weeks after the enteric temperature had reached the normal level; and the appearance of these ulcers was such as to lead us to conclude that it would have required at least another week or fortnight to complete their repair. In other words, the ulcers would not have healed till four or five weeks had elapsed from the termination of the fever.

NOTES ON A CASE OF ENTERIC FEVER, WITH SYMPTOMS CLOSELY RESEMBLING THOSE OF PERFORATION—RECOVERY WITHOUT OPERATION.

By R. TRAVERS SMITH, M.D. (Univ. Dubl.), F.R.C.P.I.;
Visiting Physician to the Richmond, Whitworth, and Hardwicke Hospitals, Dublin.

[Read in the Section of Medicine, November 20, 1903.]

R. D., aged fifty-six, a compositor by occupation, was admitted to the Hardwicke Fever Hospital on March 7th, 1903. He complained of having been ill for two weeks, during the latter of which he was confined to bed. He had not seen a doctor before admission, but had treated himself by consuming large quantities of whisky, in the remedial value of which he had a confirmed belief. On examination he proved to be an unequivocal case of enteric fever of considerable severity. I shall refrain from detailing his symptoms, as they were the ordinary ones of enteric fever in the third week, except to say that the blood gave an unusually pronounced Widal reaction. Dr. Earl, who examined the blood, stated that in performing this test with a dilution of 1 in 50, the typhoid bacilli were markedly agglutinated by the time he had focused the preparation under the microscope. Despite the patient's occupation, no signs of lead poisoning were present, nor had he ever suffered any of its symptoms.

Till the sixth day after admission to hospital, or approximately the end of the third week of his fever, R. D. remained in much the same condition. On that day, at 9 30 a.m., he complained of pain in the right iliac fossa and hypogastrium, after which the bowels moved, and vomiting occurred. On seeing the patient less than an hour later I found that his temperature had risen from 102° (its average on previous mornings) to 104°; the pulse was 84; the respirations 28. The abdomen had become rigid, was not distended, and not tender unless sufficient force was used to overcome the rigidity of its wall in the right iliac fossa. Liver dulness was present; elsewhere the abdominal resonance was not uniform.

The general aspect of the patient was somewhat altered for the worse. He still complained of the pain. Having ascertained these points, the diagnosis of perforation was carefully considered. In the light, however, of a pulse-rate little if any above its average morning frequency, and in the absence of any indications of collapse, *despite* the onset of pain, rigidity and tenderness in the right iliac region, I was unable to form a sufficiently positive opinion to warrant the recommendation of an operation, so determined to watch the case a little longer. All food was prohibited except sips of water, but no morphia was given. An hour later the abdomen presented the same signs exactly; the pain was not so severe. The pulse had increased by four beats (to 88), the temperature had fallen one degree (to 103°). Two hours later still, all pain had gone; the pulse was 82. At 6 30 p.m. (nine hours after the onset of pain), the patient expressed himself, and looked, much better. He had sweated profusely; the bowels had just moved, the motion being free from blood. The pulse had fallen to 78, and the temperature had been recorded 100.6° a short time previously. The abdomen was less rigid, otherwise the same as in the morning. Accordingly progress was deemed satisfactory, more particularly as no morphia had been given to mask the symptoms of spreading peritonitis, for which careful watch was being kept.

An hour later (7 30 p.m.) the scene changed. R. D. was suddenly seized with violent pain in the right iliac region. He vomited some bilious fluid. On reaching hospital I found the patient in great distress from pain. His aspect was one of suffering; indeed, it was evident from a glance that a marked change for the worse had set in—in fact, that he was in a condition of collapse. His temperature had fallen to 96°; his pulse had become decidedly fast, and reached its maximum of 140 in the course of two hours. He lay on his back with his knees drawn up. On examining the abdomen it was found not to be distended, but extremely rigid. Tenderness was more marked in the right iliac fossa than it had been in the morning, considerable pressure being required to overcome the rigid muscles. Liver dulness was present over a smaller area than had been observed in the morning, the probable result of the presence of distended intestines beneath the rigid abdominal wall. The breathing was rapid and almost entirely thoracic. The diagnosis of perforation was

now irresistible. I therefore recommended immediate operation to the patient, who, though quite clear in his mind, refused. It was urged upon him that it was the only chance of saving his life, to which he replied that he would rather die than undergo an operation. The lapse of half an hour and the continuance of his pain during the time did not shake his determination. Under these circumstances I ordered a quarter grain of morphia hypodermically, and the continued abstinence from all food except sips of water, feeling at the time that the case was hopeless. The night was passed in comparative freedom from pain and with a considerable amount of sleep.

At 4 a.m., temperature 104.8°, respirations 36, pulse 96.

At 5 30 a.m., temperature 103.8°, respirations 24, pulse 100.

At 8 a.m., temperature 101.8°, respirations 28, pulse 112.

These observations go to show the fluctuations of temperature and pulse-rate which may occur in such cases, and it was noticed that as the former tended to fall the latter tended to rise in frequency, and *vice versâ*. On seeing the patient on my morning visit following, though the temperature was no longer at a point indicative of collapse and the pulse was slower, he seemed worse in other respects than on my visit the night before. His tongue and mouth were dry, voice extremely weak, muscles tremulous, prostration marked. His general appearance looked most unfavourable. The abdominal physical signs were as they had been twelve hours before; the pain, however, was less acute. No urine had been passed for at least twelve hours, yet the suprapubic region was resonant. This retention persisted for twelve hours longer without causing distress or signs of bladder distention, at the end of which time urine was passed naturally; unfortunately the quantity passed was not measured. During the next three or four days the patient lay in a truly critical state. Vomiting occurred several times daily, increasing his exhaustion. Pain became severe from time to time. The abdomen did not become distended or generally tender. The pulse, prone to fluctuation, on the average remained about 90, very weak and small. Pyrexia continued much as before the onset of the abdominal complication.

R. D. now began to improve steadily, though pyrexia continued for nearly a fortnight. As the rigidity and tenderness of the abdomen disappeared a persistent ill-defined swelling in the right

iliac fossa could readily be detected. This tumefaction (almost certainly the result of local peritoneal thickening and matting) was still evident, though less distinctly so, when the patient left the Hardwicke Hospital on April 29th. No peritoneal abscess had formed. A few weeks after his discharge the patient was in his usual health.

A few words concerning the treatment of the case. Morphia was of necessity given to relieve bad pain, opium stupes gave relief when pain was less intense. The choice of diet, of course, caused the greatest anxiety and difficulty. For twenty-six hours after the onset of pain nothing was given per mouth, except sips of water. Then dilute peptonised milk was given, two teaspoonfuls every hour at first, and gradually increased. Next a little raw meat juice and panopeptone were allowed. Even this meagre amount of food was not all retained by the stomach. Nutrient enemata were tried, but appeared to irritate the rectum and produce iliac pain; in fact, the patient developed such a terror of them that they were stopped after a few had been given. For three days after the urgent abdominal symptoms the bowels, previously regular, remained confined. A small enema of castor oil was given and produced a satisfactory fluid motion. From that time the bowels moved spontaneously every day, the movement being preceded and accompanied by abdominal pain as a rule. The origin of this pain was most probably some dragging upon adhesions.

Conclusions.—Though the existence of a perforation in this case cannot be asserted positively, it is my own opinion such did occur. The following solution of the clinical phenomena appeals most to me. In the first instance a mild and limited peritonitis developed from inflammatory extension through the wall of the bowel, hence the preliminary pain without much constitutional disturb-

ance. The subsequent onset suddenly of violent pain accompanied by well-marked collapse, as indicated by subnormal temperature, rapid pulse, cold sweating, &c., coincided with the occurrence of perforation. Further, peritonitis now developed, but did not become generalised owing to the existence of the following favourable conditions at the time of perforation:—

1. The bowels were comparatively empty, no food having been given for ten hours previously, and two motions having passed from them in that time.

2. Some adhesive peritonitis was already present which retarded the escape of intestinal contents, and limited the range of movement of the perforated portion of the intestine.

3. The subsequently continued abstinence from food and the administration of morphia also played their part in limiting the movement of the intestine.

Finally, I would say that if the above case was really one of perforation, it is interesting as exemplifying what is known to happen rarely—namely, spontaneous recovery after this complication. If it were not a case of perforation, it is none the less interesting as being illustrative of the impossibility of making certain of a correct diagnosis when all the classical early symptoms of perforation can be so closely imitated by some other condition.

The lesson which should *not* be learnt from the case is, that it is justifiable to postpone operation when one has sufficient grounds for thinking that a perforation is probably present.

I am indebted to my late resident pupil, Miss Ovenden, for many careful observations and notes upon this case.

THE DIAGNOSIS OF PERFORATION IN TYPHOID FEVER.

By ALFRED R. PARSONS, M.D. (Univ. Dubl.);
Fellow of the Royal College of Physicians of Ireland;
Physician to the Royal City of Dublin Hospital, and the Royal National Hospital for Consumption.

[Read (in part) in the Section of Medicine, November 20, 1903.]

Of all the complications of typhoid fever none demands earlier recognition, if the patient's life is to be saved, than the occurrence of perforation. The advance in surgical technique during the past decade has, in this respect, enormously increased the responsibility of the physician. Twenty years ago he could do little more than be guided by traditions hallowed by time and authority, and follow Heister, who, writing in 1739 on perforation of the bowel, could only advise that the patient be kept quiet, that he be urged to eat abstemiously, and to lie upon his belly, and that the rest be left to Divine Providence and the strength of the constitution. But now the peritoneum has been robbed of its unknown terrors, and all are agreed that the proper way to close a perforation of the gastro-intestinal tract is by a needle and silk, and not by opium. Operative interference in typhoid fever is further facilitated by the fact that in about eighty per cent. of the cases the perforation is within eighteen inches of the ilio-cæcal valve. The real difficulty in saving cases of perforation lies not in the surgical technique, though skill and resource in the operator are essential, but in the early recognition of the intestinal complication.

In some cases, doubtless, the onset of symptoms of perforation is striking, if not almost pathognomonic, and there is no ground for hesitation as to what the proper treatment

should be. In cases admitting of an accurate diagnosis there can be no choice between an almost certain and painful death in twenty-four or forty-eight hours, if an operation be not undertaken, and a fair chance of recovery in the hands of a competent surgeon. There is, however, another class of cases in which the physician has only a suspicion that perforation has occurred. If certain signs suggest perforation, other signs tend to negative it. It therefore becomes his duty to most carefully balance and weigh the positive against the negative indications, and decide whether the case demands exploration or otherwise. Certain general considerations must influence him in coming to a decision. He may start assured that in 95 per cent. of the cases in which perforation has taken place, recovery is a practical impossibility without an operation. Curschmann, in the article on typhoid fever in Nothnagel's Practice of Medicine, states, with Osler's approval, that not more than 5 per cent. of the unoperated cases of perforation recovered. Keen, basing his observation on 158 cases of operation for perforation in enteric fever collected by him, gives 23.41 per cent. of recoveries. Of 16 cases operated on in the Johns Hopkins Hospital, with every convenience at hand, and a staff as keen as possible in the early detection of perforation, 6 recovered. This gives a percentage of 37.5.

On the other hand, it cannot be forgotten that an exploratory operation is not free from risk. Undoubtedly, the risk is a diminishing one, but it has not yet reached vanishing point. But in addition to the risk at present inseparable from exploration, we must remember the depressing effect which the preliminary arrangements for such an operation must have on the patient. The irritation of the ether acting on bronchial tubes already somewhat inflamed is a factor which must be reckoned with.

Such considerations as these have no weight in a case in which the diagnosis is clear. If, however, the diagnosis be only problematical, it cannot be overlooked that to submit a patient in the third or fourth week of typhoid fever, with a weakened heart, a frequent pulse, and a considerable degree of bronchitis, to an unnecessary exploratory laparotomy, must materially minimise his chance of recovery. The risk of the operation may be diminished by performing it, as Cushing suggests, under local cocaine anæsthesia. By following this recommendation we avoid the danger of aggravating the bronchitis, but we do not remove the mental shock directly connected with so grave an operation as an exploratory laparotomy.

An accurate diagnosis, so that an operation may not be unnecessarily undertaken, is therefore of great importance, but an early and accurate diagnosis is of vital importance. The absolute necessity of not losing time after perforation has taken place is demonstrated by some statistics collected by Professor Osler. Of 15 cases operated on within twelve hours 4 recovered; of 20 cases operated on between the twelfth and twenty-fourth hour 6 recovered; and of 13 operated on in the second twenty-four hours only one recovered.

How are we to arrive at the desideratum of an early and accurate diagnosis? By recording cases of perforation, and cases with simulated perforation, and as far as may be deducing from them indications which favour or tend to negative perforation. I venture to submit to the Academy three cases of typhoid fever in which perforation either actually occurred or was simulated.

In Case I. the diagnosis was correct, but the patient succumbed; in Case II. it was wrong, but the patient recovered; while in Case III. it was, and is still, doubtful, but the patient has long since recovered.

Case I.—G. C., a well-developed lad of twenty-one years, was admitted to Sir P. Dun's Hospital on 9th September, 1890, suffering from typhoid fever. He had been ailing for ten days, but had given up work only six days previous to his admission. His temperature was 101° F. and his pulse 90 per minute. The following morning his temperature reached 104.4°. He was sponged during the night, and the next morning the temperature was 103° F. Everything seemed quite satisfactory till 5 p.m., when he was seized with severe pain in the abdomen. At 6 p.m. he had a constant desire to pass urine, and complained of pain shooting down the penis. He was pale and somewhat collapsed. At 7 p.m. these symptoms had increased, and he was sweating profusely. The hepatic dulness was deficient. A diagnosis of perforation was made, and at 8 p.m. he was seen by the physician on duty, who ordered stimulants by the rectum and a hypodermic of morphine and atropine. During the night the pain ceased, the extremities became cold, the patient thought he was better, then became slightly delirious, and died early the following morning, about twelve hours after the perforation had occurred.

The *post-mortem* examination revealed an acute peritonitis due to the perforation of a typhoid ulcer close to the ilio-cæcal valve. The actual size of the perforation was the cross section of a lead pencil.

In this case the diagnosis of perforation was clear, and the treatment of a similar case would now, unquestionably, be a laparotomy and closure of the perforation. The striking features of this case were the sudden onset of violent pain, the frequent desire to micturate, and the pain shooting down the penis, suggesting that the peritoneal coat of the bladder was becoming inflamed, and the diminution of the area of hepatic dulness.

Case II.—O. G., aged twenty-seven years, was admitted to Sir P. Dun's Hospital on 6th July, 1902, in his tenth day of an attack of typhoid fever. For the first few days he was in hospital he had diarrhœa, but for the remainder of his illness constipation.

By the morning of the nineteenth day his temperature had become almost normal. On that day he complained of pain in his left leg, and his temperature rose to 103.2° F., owing to the formation of a thrombus in the left femoral vein. On the morning of the twenty-sixth day of his illness his temperature was 102° F. On the morning of the twenty-seventh day he awoke with severe pain in the right iliac fossa. When he was seen a couple of hours later by the physician on duty there was considerable resonance in the right iliac fossa. The resonance gradually increased in area and the temperature dropped. His pulse did not change materially in frequency. It was considered that his symptoms pointed to a perforation in the neighbourhood of the ilio-cæcal valve, and the surgeon on duty was requested to do an exploratory laparotomy. The abdomen was opened through a small incision in the right linea semilunaris. The abdominal contents seemed perfectly normal. There was no peritonitis, no extravasation, and no gas. The wound was closed. Next day the temperature fell to 96.4° F., and the pulse increased to 120. The temperature subsequently rose to 102° F., continued irregular for a few days, and then settled down. The patient was discharged from hospital apparently perfectly well.

I lost sight of him for some three years, till he came to the Royal City of Dublin Hospital on the 15th April, 1895, complaining of swollen and ulcerated legs. The legs were œdematous; showed large discoloured areas, evidently produced by hæmorrhagic extravasations; and above each ankle there was an ulcer. An examination of the abdomen revealed the presence of an enormous vein starting from each groin, ramifying over the front of the abdomen and extending up to the thorax. He had developed thrombosis of his inferior vena cava, but, fortunately, the clot did not reach as high as his renal vein. It is some years since I saw this patient, but I recently heard that he was alive and able to work.

In this case perforation was simulated by the sudden onset of severe pain in the right iliac fossa, accompanied by a gradually increasing distention and a falling temperature. The condition of the pulse was rather against the occurrence of perforation, but the weight of evidence

favoured a diagnosis of perforation, and led to what was subsequently shown to be an unnecessary exploration.

Case III.—On Thursday, 27th Dec., 1900, I was asked to see Miss A., one of the nurses in the Isolation Building of the Royal City of Dublin Hospital, who was complaining of headache. She had not been feeling well for a couple of days, but she had remained on duty till 5 p.m. on the 26th Dec. Her temperature that evening was found to be 101.6°. When I saw her on the following day her chief complaint was of violent pain in the occipital region. There was no retraction or rigidity of the head; tongue was tremulous and coated with white fur; pulse 96, temperature 100°. Two aperient pills had been taken a couple of days previously with a satisfactory result. She felt very well on the 28th, at noon, pulse 72, temperature 98° F. She was anxious to be allowed up. She took a little raw apple during the day without permission. In the evening, temperature 100° F., pulse 72. On the following morning (Saturday, 29th), I had a note from my Resident Pupil (Mr. Buchanan), stating that the nurse had been in bad pain since 4 a.m. On arriving at the hospital I ascertained that with the assistance of a mild hypnotic she had slept soundly till 3 40 a.m., when she awoke with violent pain in the hypogastrium, shooting up towards the epigastrium, and all over the abdomen. At 5 a.m. she vomited. At 11 a.m. she lay on her back with her legs acutely flexed on her abdomen, and unable to stretch them down. She was pale, and looked extremely ill. The skin was a little moist; the tongue was coated, and dry over a triangular area at the tip. The alæ nasi were not working. The respirations were 36 per minute and superficial; temperature 102.6°, pulse 108. She objected to the weight of the bed clothes on her legs. On examining the abdomen she was very tender all over it, and just as much in the left iliac fossa as in the right. On percussion the note was almost uniformly resonant over the abdomen, and there was also a resonant note in the two lowest intercostal spaces in the right nipple line (diminution in area of hepatic dulness). She had not been able to pass urine since 4 a.m., though she had need several times; but as a catheter was being passed the urine came before the instrument had entered the bladder. The urine contained no albumen, but indican was present, and the "diazo" test gave

a deep red. As the symptoms were so suggestive of acute perforative peritonitis, I asked my then colleague, the late Sir George Duffey, to see the patient in consultation with me. Preparations were made for an operation, but we decided to wait for a little longer. At 2 p.m., temperature 103°, pulse 104; otherwise no decided change. She was given enemata of boracic acid lotion, which she retained. At 4 p.m.—*i.e.*, 12 hours after onset of violent pain—she was heavy; pulse 108, temperature 104° F., respiration 34, and she had short periods of ease from pain. The first sound of heart was feeble, and the abdomen was a little more distended. She looked a shade better; voice a little stronger, and she was able to move her legs a little. She slept at 12 midnight. Since 9 p.m. she has vomited twice and hiccoughed three times. She is sleeping for past 20 minutes, and continued to do so till 12 20 a.m. On awakening, temperature 101°, pulse 120, respiration 32. The pain is not so severe; the tongue is moist. 30th Dec., 10 a.m.—Had some snatches of sleep during night, in all 1½ hours; vomited at 8 a.m., two ounces of greenish fluid. Decubitus still dorsal; sunk down in bed; looking very ill; temperature 99.8°, pulse 108. 4 15 p.m.—Abdominal muscles move slightly in respiration; slept 40 minutes. 11 p.m.—Hiccough and vomiting troublesome during afternoon; passed two light-coloured fluid motions. Blood removed to-day gave a positive Widal. 31st Dec., 10 30 a.m.—Broken sleep, in all 2½ hours; flatulence and hiccough not quite so frequent; vomited at 7 a.m. some bile-stained fluid; bowels acted twice; pain much less, referred now to left hypochondrium; feels very weak, as if she were going right through bed; pulse 104, temperature 99.4°. 4 30 p.m.—Temperature 101.8°, pulse 112, respiration 36. 1st Jan.—Slept 3½ hours at intervals after taking ♏ x. of liq. morph. muriatis; Widal again positive, 1 in 50; pulse varied during the day from 100 to 112. 2nd Jan., 11 30 a.m.—Distention of abdomen greater than on previous occasions, but there is little pain on gentle pressure over the abdomen; aspect better; pulse 96; has had numerous liquid motions during the day. 7 p.m.—A brownish motion passed on this day contained a portion of apple; temperature 102° F., pulse 105; some vomiting and hiccough. 3rd Jan.—Looks very ill; face drawn; did not sleep well, and vomited about one pint of greenish fluid; hiccough troublesome; considerable distention of abdomen. Passed a restless day,

vomiting and hiccough frequent. She was given a hypodermic injection of morphine and strychnine. 4th Jan.—Vomiting not so frequent, but hiccough very troublesome; bowels have moved six times, but distention has rather increased. There is now practically no liver dulness. Temperature 99.4°, pulse 116. 5th Jan.—Owing to the intense fœtor of the evacuations and the abdominal distention, boric enemata were administered, producing seven motions; she has not vomited for 36 hours; hiccough has not been so troublesome; aspect better; bowels are acting; when dozing the respirations are quieter. There is, however, increased frequency of the pulse (126), with a lower temperature (99° F.). 7th Jan.—No vomiting; less hiccough; better in every respect, except that her pulse keeps so frequent (120 to 130); temperature 101°. 8th Jan.—Temperature rose to 103.2° F. for a short time, but the pulse has fallen to 112, and distention is less. From this date onwards there was a gradual, but continuous, improvement in the patient's condition. The hiccough ceased on the morning of the 10th Jan., the distention subsided; strength improved. Pulse fell to 88 and temperature to 99.4° on 19th inst. On the 26th Jan. she was allowed bread, and she sat up in bed on 28th. She left the hospital on 18th Feb., and has since been in the enjoyment of excellent health.

This case was undoubtedly one of typhoid fever, The well-marked Widal reaction, as observed in dilutions of 1 in 50 by two independent examiners on two different occasions, and occurring in a patient who never previously had typhoid fever, negatives any other hypothesis. But what is the explanation of the acute abdominal symptoms? Peritonitis, due to intestinal perforation and extravasation, is at once suggested by the sudden onset of the violent abdominal pain, the vomiting, the superficial respiration, the great tenderness over the abdomen, the decubitus, the diminution in the area of hepatic dulness, the increasing frequency of the pulse, the inability to pass urine, &c. As against perforative peritonitis it must be admitted that the temperature tended rather to rise than to fall, that the patient got short snatches of sleep of some fifteen

minutes' duration, without the internal administration of any hypnotic, and that twenty hours after the onset of acute symptoms the pulse was only 120 and the patient was free from violent pain. It may also be alleged that the acute symptoms developed on the fifth day of the patient's illness, which would be too early for perforation to occur. The patient was subsequently questioned carefully on this point, and she admitted that though discharging her nursing duties as usual, and partaking of ordinary food, she had not felt really well for a fortnight previous to the 25th December. During this period she took her temperature on a couple of occasions, but did not find it above 99° F. If these fourteen days should be added to the above-mentioned five we reach a date in the history of typhoid at which perforation might very well occur. We have, further, in the uncooked apple eaten without permission on the 28th December, a dietary indiscretion which might be considered sufficient to encourage perforation. My difficulty in regarding this as a case of perforation and extravasation is the complete recovery of the patient without the formation of any abscess. Curschmann, to whom I have already referred as stating that five per cent. of perforations recover without operation, indicates that this result is to be attributed to a localised-limiting peritonitis generally with the formation of an abscess. In this case the symptoms were not at any time localised; there was never any sign of abscess development, and it is hard to imagine that a general infection of the abdominal cavity by typhoid fæces could terminate by recovery without operation. Personally, I have not met a case in literature which does for perforation in typhoid fever with general peritonitis what a case recorded by Hughes, Ray and Hilton in "Guy's Hospital Reports" has done for perforation of a gastric ulcer. They have recorded a case of a

perforated gastric ulcer which recovered under the administration of large doses of opium. Three months subsequently another ulcer perforated in the same patient, and the autopsy revealed the accuracy of their diagnosis in disclosing the presence of a peritonitis of some months' standing with abundant moderately firm adhesions between the intestinal coils.

Perforation without extravasation is, I think, improbable, as, considering the amount of food partaken of on the 25th and 28th December, it is unlikely that the ileum was empty on the morning of the 29th December.

The violent pain had abated within twenty hours after its onset, the abdominal rigidity had lessened in two days, but bilious vomiting lasted in all for some six days, while hiccough persisted, though in a diminished intensity, for four days after the vomiting had ceased.

As a possible solution of this obscure case, and as an explanation of the diffuse peritonitis which I believe was present, the suggestion that the existing factor was a ruptured mesenteric gland is, I think, defensible. The question of operative interference was often discussed with my late colleague, Sir George Duffey. Even if perforation had occurred, we felt that in the patient's grave condition exploration was at best a forlorn hope. And we never had such a combination of the following symptoms which, when weighed against indications negativing perforation, seemed to us sufficiently strong to justify surgical intervention.

From these three cases the lesson of the danger of trusting too implicitly in any one sign or symptom as pathognomonic of perforation may be learned. I venture, in conclusion, to set out in tabular form some of the signs and symptoms which, though not arranged in the order of their frequency or importance, are worthy of consideration when

a physician is face to face with the question, Has perforation occurred?

1. Pain. This is characterised by its sudden onset and its violence. It may start in the right iliac fossa or lower abdominal region, but it soon spreads all over the abdomen.

2. Rigidity of the abdominal wall, which will often be accompanied by flexion of the lower limbs and the development of a decubitus suggestive of profound peritoneal irritation.

3. Tenderness on pressure all over the abdomen, but especially so in the lower half.

4. Respiration. This is superficial, is increased in frequency, is mainly, if not entirely, thoracic, and is accompanied by activity of the alæ nasi.

5. Pulse. The frequency of the pulse, as a rule, increases—in some cases about 10 beats per hour.

6. The temperature is not of much use. If previously elevated it may drop on the occurrence of perforation. A normal or sub-normal temperature is not incompatible with acute generalised peritonitis.

7. The aspect of the patient is suggestive of acute suffering. The face is pallid, the skin moist, and the extremities cool. These symptoms may subside after the immediate effects of perforation are over, to return in an aggravated form on the development of definite peritonitis.

8. Micturition. There may be, as in Case I., a constant desire to pass water. In other cases there is retention.

9. Vomiting may occur at the moment of perforation or not for some hours later, after peritonitis has developed.

10. Hiccough is usually a late symptom.

11. Liver dulness has not the same value in typhoid perforation as in gastric perforation, in part due to the fact that owing to intestinal distention it may be often diminished without perforation, and in part because there

does not seem to be the same amount of free gas in the abdominal cavity in typhoid as in gastric perforation, and consequently the diminution or abolition of the area of hepatic dulness is more frequently met with in the latter variety of perforation. Notwithstanding these drawbacks, the gradual diminution in the limits of hepatic dulness in a case in which a couple of hours previously the area was normal may prove a valuable aid.

12. Uniform abdominal note. This condition is not likely to be met with except in cases in which a considerable amount of gas has escaped into the abdominal cavity. It is a late sign, and is present with marked abdominal distention shortly before death.

13. The urine. The only constant abnormality I have noticed in perforative peritonitis is the presence of indican, but this substance is so frequently found in enteric fever that detection gives little assistance.

14. Leucocytosis. In the absence of other complications the occurrence of leucocytosis in a patient whose blood previously showed a leucopænia, "may be a valuable help, but it is not constant."

MILK: HUMAN AND BOVINE.

By WALTER G. SMITH, M.D.;
Ex-President, Royal College of Physicians of Ireland;
Physician to H. E. the Lord Lieutenant.

[Read in the Section of Medicine, March 4, 1904.]

As mammals we normally begin our life on a milk diet, and the same fluid commonly constitutes one of the last forms of nutriment we take as life ebbs away.

Histologically a milk gland represents an aggregate of hypertrophied sebaceous glands, and, since small quantities of casein have been found in the sebum of mammals (Neumeister) it is not unreasonable to suppose that there is an ontogenetic connection between the sebaceous and milk glands. Moreover, transitional forms between the two kinds of glands are known to occur in Monotremata.

Although mammals rank high in the scale of evolution, their origin dates far back in geological time, and the hypothesis has been suggested by Hæckel that a local development of the sebaceous glands on the ventral skin gave rise, probably during the Triassic period, to the mammary organ.

Milk is essentially an emulsion of butter-fat in a solution of salts, proteids, and sugar. Two views have been entertained as to the method of production of milk—viz., the true secretory and the disintegration theory.

The former, and more probable, view is that supported by Schäfer ("Text-Book of Physiology," I., p. 666). The cells extrude their secreted materials into the alveoli, much as in the case of other secretions, without undergoing any histological degeneration. The secretion may be compared with that of saliva by a mucous salivary gland.

The other view, which has long held the field, likens the mammary secretion to that of the sebaceous glands, where undoubtedly complete disintegration of the whole cell occurs, new cells being rapidly formed to fill up the depleted ranks.

It was supposed that as the older gland-cells passed through the stages of fat-degeneration and disintegration their place was taken by younger cells which went through the same changes, and so the process of milk formation went on continuously for a considerable time.

Verworn accepts this view, and remarks:—"What occurs as a normal process in the cells of the lacteal glands occurs under pathological conditions in much greater extent in various tissues, and leads almost always to incurable and fatal losses, since, as a rule, no reparation is made by the younger cells."

More than thirty years ago Virchow picturesquely said that the production of milk in the brain instead of in the lacteal glands constitutes a form of brain softening. And he quaintly adds:—"The same process that in one place affords the happiest and sweetest results, in another induces a painful and bitter wound."

Of the influence of the nervous system upon the mammary secretion little is known experimentally. In this connection, however, it is worth recalling a case reported by Dr. Routh in 1897. In his patient the spinal cord was, as confirmed by autopsy, completely destroyed in the region of the seventh thoracic nerve. Yet the breasts enlarged during the pregnancy, and during the puerperium the mammary function was performed with normal punctuality and persistence. The quality of the milk was good (Schäfer, "Text-book of Physiology," II., p. 812. From *Trans. Obst. Soc., Lond.*, 1897).

The milk of various mammals has been employed for

human nutriment, but practically we need consider only two—viz., woman's and cow's milk.

All that relates to the composition and properties, individual and comparative, of these two foods, must needs have a profound interest for medical practitioners, and a deep significance for the health of the public. Hence a large amount of experimental work has been done, and an enormous literature has grown up dealing with the milk question.

Everyone knows of the burning controversy which still rages as to the relations of human and bovine tuberculosis. Upon this, the bacteriological side of the subject, I do not intend to touch. It is fully dealt with in a recent monograph by Swithinbank and Newman (1903). I propose in this paper simply to lay before you a few observations, and to exhibit some simple chemical experiments in illustration of the remarks. Upon the physical qualities of milk I shall say very little.

The opacity of milk is due to three factors:—

(*a*) An emulsion of fat.

(*b*) Insoluble and gelatinous calcium phosphates—

$$CaHPO_4 \text{ and } Ca_3(PO_4)_2.$$

(*c*) Caseinate of calcium.

When milk is boiled everyone is familiar with the skin or pellicle that forms upon its surface, and which has considerable tenacity. Various explanations have been put forward. Salkowski states that the pellicle consists merely of partially desiccated milk. It probably consists largely of casein-calcium, and may also, probably, include a little coagulated lact-albumen. Moreover, part of the calcium is separated as insoluble tricalcic phosphate, most likely by a re-arrangement similar to that which I have described as apt to happen when urine is boiled.

Drying is an essential condition for the formation of a

film, and no film will be formed if milk be covered with paraffin and boiled. A film is produced upon heating any proteid solution containing emulsified fat, or even paraffin (Jamison and Hertz, *Journ. of Physiology*, XXI., 1901, p. 26).

A singular statement is made by Swithinbank and Newman in regard to the temperature of scalded milk. They affirm that the temperature of milk, taken off the fire as "boiling" by the ordinary cook or nurse, rarely exceeds 90° C., and often falls short of this.

For the complete investigations of solutions, whether inorganic or organic, we have recently learned that account must be taken of the *data* of physical chemistry as well as the results of ordinary chemical analysis.

In my paper on Dissociation, read before the Biological Club in 1902, I pointed out the interesting fact that blood and milk, although chemically so different, have the same osmotic pressure. It is concluded, therefore, that they contain in unit volume the same number of molecules. By way of contrast, let us, for a moment, turn our thoughts to the renal secretion. The kidneys secrete a fluid which, in comparison with the blood, is at one time hypertonic, at another time hypotonic, according as the blood is too concentrated or too dilute, for the essential function of the kidney is to maintain an average composition of the blood, or, in popular language, to "purify" it.

Cryoscopic observations (*i.e.*, depression of freezing point), coupled with those on electrical conductivity, lead to the conclusion that in milk, human and bovine, some of the molecules which exert osmotic pressure exist in the dissociated state, and, therefore, conduct electricity; and some exist as organically combined molecules, which are non-ionised, and hence are non-conductors.

I next ask your attention to the comparative composition of human and cow's milk, and I elect Söldner's analysis:—

	Cow	Woman
Fat - -	3.42	3.11
Lactose - -	4.25	6.36
Ash - -	0.70	0.24
Citric acid - -	0.18	0.05
Albumen and unknowns	3.22	1.95

König's analysis does not materially differ from this, but it does not specify citric acid.

In the ash of either kind of milk the salts of potassium predominate over those of sodium—the converse of what is found in the ash of urine.

Cow's milk contains six times as much CaO as human milk, and a pint of cow's milk contains a larger amount of CaO than a pint of freshly made lime-water. It is well recognised that the Ca salts play an essential part in the clotting of casein.

The reaction of fresh milk is feebly alkaline, or often amphoterous to litmus. The reaction is conditioned by three factors:—

(1) Neutral casein—calcium compound.

(2) Monohydric phosphate of potassium, K_2HPO_4: blues red litmus.

(3) Dihydric phosphate of potassium, KH_2PO_4: reddens blue litmus.

The net reaction depends upon the relative proportion of the two phosphates.

One of the most curious facts in regard to the composition of milk has been known since 1888 (Henkel). I refer to the presence, in measurable amount, of citric acid, which may be considered a specific product of the mammary gland. It has been shown that cow's milk includes from 1 to 3 times as much citric acid as woman's milk, and

the amount may be reckoned as equivalent to about 0.25 per cent. of calcium citrate.

When milk is subjected to dialysis the citrate passes through the dialyser. This discovery suggests the reflection that this unique occurrence of citric acid in the animal body may be connected with what Dr. Cheadle calls the "mysterious antiscorbutic power of milk."

Furthermore, it appears probable that in the association of calcium citrate with lactose lies the explanation of a colour test between human and cow's milk, which was published by Umikoff in 1898, and which I exhibit to you.

In 1898 Dr. Umikoff, of St. Petersburg, described a test which serves to readily distinguish human from cow's milk, and, furthermore, gives indication of the age of woman's milk, reckoned from the beginning of lactation. After the eighth month of lactation the reaction is not to be depended upon.

Five cc. of milk are treated with 2.5 cc. of liquor ammoniæ (10 per cent.), and warmed for 15 to 20 minutes in a water bath at 60° C. Human milk assumes a violet red or buff-brown colour, and the shade is deeper according to the age of the milk. Cow's milk, of different ages, when similarly treated, turns yellow, or, at most, yellowish brown. Milk kept for a month (by thymol) and boiled milk give the reaction.

Umikoff's paper was published in Russian. Dr. Sieber has, however, repeated and extended Umikoff's observations, and has published an interesting paper in the *Zeitschrift für physiologische Chemie*, XXX., 101.

It was not easy to ascertain upon what factor or factors the colouration depended. According to Sieber's researches the colour appears to be due to an interaction between lactose, ammonia, and the minute quantities of calcium citrate which occur in human milk.

The reason why cow's milk fails to yield the colour reaction seems to be this:—Cow's milk contains six times more CaO than human milk, while its proportion of citric acid is only from 1 to 3 times as great. Neither the fat nor the proteids of milk have anything to do with the reaction. The presence of milk sugar is indispensable, but the intensity of the colouration is not proportional to the amount of lactose. When cow's milk is warmed with ammonia all the citric acid is precipitated as calcium citrate along with calcium phosphate. In human milk, on account of the small proportion of CaO, part of the citric acid remains in solution. Umikoff's reaction is briefly noted in Stirling's "Practical Physiology," 4th Ed., 1902, p. 112. Three years ago I made several experiments with this test, and can now again confirm its validity.

In the proportion of fat it will be seen that there is no considerable difference between cow's milk and human milk. Woman's butter is richer in oleic acid. Some mammals have an extraordinarily high content of fat in their milk, and in the dolphin this amounts to 45.8 per cent.

The proteids in milk are at least 3 in number:—

(1) Casein (Caseinogen)—Is a nucleo-albumen of strongly acid character. It exists in milk as a neutral Ca compound, and can be "salted" out by NaCl.

(2) Lacto-globulin—"Salted" out by $MgSO_4$.

(3) Lact-albumen—"Salted" out by $(NH_4)_2\ SO_4$.

Human milk contains about twice as much albumen as cow's milk.

Colostrum is rich in globulin and lact-albumen, and hence coagulates upon boiling. It is poor in lactose. The caseinogen and fat are closely associated in normal fresh milk, and appear to form, along with calcium salts, a highly complex organic compound (Swithinbank and Newman).

According to Droop Richmond, the action of rennet is to split up the casein into a dyscaseose, the calcium compound of which is insoluble and which forms curd, and a soluble caseose.

The peculiarities of human casein are that it is more easily soluble in alkalies, in acetic acid, and in water. It yields less nuclein upon digestion, and it contains a higher proportion of sulphur. (Cow's casein = 0.75 per cent.; human casein = 1.11 per cent. of sulphur.)

From all this it is easily seen how imperfect must be our efforts to prepare "humanised cow's milk," which is so glibly advertised and often misused. Contrary to what has been sometimes asserted, fresh milk does not contain any albumose or peptone (Salkowski, *Zeitsch. f. phys. Chemie*, XXXI., 336). I show you a specimen of cow's milk to which 3i. of chloroform was added three years ago. You will observe a white precipitate which consists of coagulated casein, along with entangled fat. The yellowish, neutral reacting, supernatant fluid is quite free from casein, and is found to contain unaltered lact-albumen, which can be coagulated by heat alone. Salkowski has shown that the chloroformed milk is devoid of either albumose or peptone. Hence no ferment action or transmutation of proteids has taken place.

Different views have been held as to the exact nature of the carbohydrates in milk. They are usually expressed in analysis in terms of lactose alone. Still it is asserted by some authors—*e.g.*, Neumeister—that lactose is associated with another carbohydrate of a dextrin-like character, but the proof of this does not seem to have been conclusively established.

In the *Brit. Med. Journ.*, 1898, Jan. 22nd., p. 199, Messrs. Carter and Droop Richmond published an interesting paper on the "Composition of Human Milk." Mr. Richmond is analyst to the Aylesbury Dairy Co., and is an

acknowledged expert in the chemistry of milk. As the result of their experiments, especially those with polarised light, they come to the conclusion that the sugar of human milk is not ordinary lactose. They, further, are of opinion that there is some evidence that two sugars are present—a crystalline aldobiose and an amorphous carbohydrate (animal gum?).

In connection with this point I carried out some experiments about three years ago in the chemical laboratory of Trinity College, Dublin, by permission of, and with the assistance of, Dr. Emerson Reynolds. The proteids were separated from the milk by van Ketel's method—viz., precipitation by solution of lead acetate (10 per cent.) and a little liquefied carbolic acid. A nearly clear filtrate is thus obtained. The lactose was estimated by Fehling's solution, before and after inversion, and the results compared with those obtained by Mr. Werner with a recently prepared solution of pure lactose. The two sets of results almost exactly tallied, and hence go to support the usual view that the lactose of human milk does not essentially differ from the lactose of cow's milk.

PRESERVATION OF MILK.

It has been proved by Escherich that human milk is absolutely sterile when first drawn from the breast.

Sir Joseph Lister has shown in like manner that cow's milk as it comes from the udder is sterile, and that it quickly becomes infected afterwards in various ways.

Under the sensational title of "Pus as a Beverage," the *British Medical Journal*, December 5, 1903, publishes an account of a serious epidemic of acute illness due to pyogenic infection traced to suppurative mammitis in four cows.

Now the process of boiling milk sterilises it, and destroys

not only putrefactive bacteria, but also the germs of acute infective diseases (Cheadle, "Artificial Feeding," 2nd Ed.).

I will now demonstrate to you a test recently proposed by Mr. J. E. Saul, of London, whereby it is easy to distinguish between raw milk and scalded milk (*Brit. Med. Journal*, March 21, 1903, p. 664).

The test can be prepared from the photographic developer sold under the name of "Ortol."

Its active constituent (*quoad* milk) is ortho-methyl-amido-phenol-sulphate.

The subjoined table shows the chemical relationships of the reagents referred to in this paper:—

Benzene - - - -	C_6H_6.
Phenol - - - -	$C_6H_5.OH$.
(1) Amido-phenols (ortho. meta. para.)	$C_6H_4NH_2.OH$.
(2) Methyl-amido-phenol - -	$C_6H_4NH.CH_3.OH$.
Its ortho-salts = "ortol."	
Its para-salts = "metol."	
(3) Di-amido-phenol - -	$C_6H_3(NH_2)_2OH$.
Its salts constitute "amidol."	

The introduction of the NH_2 group considerably diminishes the acidic character of the phenols.

A convenient way to apply the test is as follows:—To 9-10 cc. of milk add 1 cc. of recently prepared 1 per cent. aqueous solution of ortol, and then 1 or 2 drops of commercial peroxide of hydrogen. A vivid deep red colour is quickly produced. Milk that has been previously boiled and cooled develops at most a faint pink colour on standing. I find that human milk (fourth or tenth day) gives a much fainter reaction. The reaction is not interfered with by dilute acids, or by carbonate or bicarbonate of sodium, and is merely retarded by the presence of a trace of formaldehyde. A very little raw milk added to boiled milk can be detected with ease by this convenient test.

The cause of the reaction appears to be linked with the presence in milk of an oxidising enzyme, destructible by heat. The test will not prove that a milk has been properly sterilised by heat, for a temperature of 75° C. for half an hour stops the reaction, yet any sample which affords the reaction cannot have been heated sufficiently, or must, after sterilisation, have been mixed with raw milk. Incidentally Mr. Saul points out that raw milk will serve to distinguish "ortol," the *ortho*-derivative from its *para*-isomer which is well known to photographers under the name of "metol."[a]

The latter body gives a pale *café au lait* tint to the milk. Another test to distinguish between raw and scalded milk is described by Swithinbank and Newman (*loc. cit.*). If a little 1 per cent. solution of hydro-quinone be added to milk at varying temperatures up to 30° C., and then H_2O_2 dropped in, a distinct rose colouration, assuming later a crushed strawberry tint, will gradually develop.

I find that human milk (fifth day) responded to this test more slowly, and developed a pale pink colour.

Detection of Formaldehyde in Milk.—Various chemicals have from time to time been added to milk in order to conserve it. Among these is formaldehyde. My attention was directed, by a reference in Mr. Saul's paper, to a simple test for the detection of formaldehyde in milk, which has lately been announced by MM. Manget and Marion (*Comptes Rend.*, 135, 584).

[a] In passing, I may mention that some of these organic compounds have come lately into use as hair-dyes, and have produced unpleasant irritation of the skin and even severe dermatitis—*e.g.*, aureole (contains metol, amidophenol-chlorhydrate, and monamido-phenylamine), which is applied to the hair in conjunction with H_2O_2 ("oxygenated water"). Another chemical (chlorhydrate paraphenylenediamine) is sold in solution as a hair-dye, under various names, with an accompanying bottle of "oxygenated water." They are doubtless efficient dyes (dark brown to violet black), but are liable to set up acute œdematous dermatitis.—Trans. Amer. Dermat. Assoc., 1903.

The reagent employed is another photographic developer, commercially known as "amidol." It is a diamidophenol. To perform the test, a small quantity of amidol is sprinkled on the milk, slightly diluted, and warmed. In a few moments it will be observed that normal fresh milk assumes a pink or salmon colour, which gradually deepens. The reaction is not interfered with by boric acid or by alkaline carbonates. If, on the other hand, milk contains formaldehyde, even so little as a 50,000th part, it slowly assumes a canary-yellow colour.

I find that human milk (fourth day) reacts similarly to cow's milk.

This test can also be readily applied to meat broth or meat jelly.

If a few crystals of amidol are shaken up with meat broth (or liquefied jelly) which contains formaldehyde the liquid turns yellow, deepened by ammonia.

Non-formolated broth assumes with amidol a dark rose colour, turning deep blue with ammonia.

I have observed that a simple watery solution of amidol is turned sapphire blue by ammonia.

FURTHER NOTES ON GLYCOSURIA IN INSANITY.

By W. R. DAWSON, M.D., F.R.C.P.I.;
Medical Superintendent, Farnham House, Finglas, Dublin.

[Read in the Section of Medicine, April 8, 1904.]

About two years ago[a] I had the honour to bring before you a short study of seven cases in which glycosuria was associated with insanity. These cases were classed in two categories—viz., those in which the insanity appeared to be caused by the glycosuria (*i.e.*, cases of true diabetic insanity), and those in which the morbid excretion of sugar was probably a symptom, parallel with the insanity, of the underlying disorder of the nervous system. Since then, owing to a system of periodical testing, twelve additional cases have come under my notice, all belonging to the second category. Of these I now propose to give a short account.

In seven of the cases, sugar was found upon a single occasion only, and was sometimes present in barely appreciable amount. They were as follow:—

Case I.—An old demented woman, aged sixty-seven, whose emotional tone is mostly neutral, showing neither exaltation nor depression. An extreme fondness for sweets is the only point about the patient bearing at all upon the glycosuria, which was very slight.

Case II.—A male chronic maniac, aged sixty. His general mental attitude is one of contentment, but he is at times liable to fits of angry excitement, of which there were a good many about the time when sugar was detected.

Case III.—A man of seventy-seven, who had suffered for years

[a] Transactions. Vol. XX., p. 261.

from systematised delusions, largely of an unpleasant type, and who had been confined to bed for some months owing to anasarca from chronic nephritis. His tone of mind was one of depression. Very large amounts of albumen were being excreted.

Case IV.—This was a case of secondary dementia in a man of forty-two, who was generally good-humoured and contented. He had been getting a little thin for some months before, but his general health was, and is still, good, except for a tendency to constipation.

All four cases had been for many years inmates of the institution, and were hopelessly incurable from a mental point of view.

Case V.—A slightly weak-minded woman of forty-four, suffering from her sixth attack of delusional melancholia. The glycosuria appeared while she was undergoing thyroid treatment, and was therefore probably due to the drug; but as many cases go through a course of this treatment without excreting sugar, it must be supposed that some predisposition existed.

Case VI.—A female case of katatonia, aged thirty, at about the beginning of the third stage. She was in a state of stupor with marked negativism, and under the dominion of delusions, which, at times at all events, were of an unpleasant character. Sugar was found on the morning after admission (June 12th. 1902), but not since, and she has now very much improved.

Case VII.—Sugar was also found on the morning after arrival in the case of a male patient suffering from paranoia as the result of alcoholism. He was very miserable and full of depressing delusions. Sugar has not since been found during the two months since his admission.

In every instance the urine was examined a considerable number of times without any sugar being found, and, of course, no special diabetic treatment was considered necessary.

Two further cases had what may be considered a single

attack of glycosuria, but in each of these sugar was present for at least a month, though in varying quantity, and with two intermissions in one case and three in the other. In both these cases the symptom passed off under dietetic treatment.

CASE VIII.—The first was that of a lady, aged about sixty-two, who had suffered for about three years from a mental illness which began as acute melancholia and then passed into secondary dementia with stupor, in which state she was when sugar was first detected in May, 1902. About a fortnight later she was dieted, and the sugar began to decrease. It had completely disappeared in August, and has not since returned. At first there was some urethritis, but it cannot be said that any mental change was noted.

CASE IX.—This was a case of hebephrenia in a lad of nineteen, which has been published elsewhere.[a] He came as a voluntary boarder in March, 1902, improved greatly under treatment, and was discharged in six weeks, but soon relapsed, and returned by his own wish on May 24th. On readmission, sugar was found, and from the end of May he was put on diabetic diet, which was continued after the sugar had disappeared (by June 18th). On his return he was brooding, suspicious and depressed, but improved slightly as the sugar disappeared, so that the glycæmia may have had some influence on his mental state. Improvement stopped there, however, and, as in most cases of this disease, the prognosis is very gloomy. There was no subsequent return of the sugar as long as he remained with us.

In the next two cases sugar was found on more than one occasion, but always as a transitory occurrence.

CASE X.—The first case is one of chronic delusional melancholia of over twenty years' standing, in a woman, aged fifty-nine, whose general physical health is excellent, and who has now become so far demented that the depression is of a very mild character. In August, 1901, she complained of pain in the region of the kidneys, and at the same time a trace of some

[a] Journal of Mental Science. April, 1903. P. 303.

reducing substance appeared in the urine. Early in 1902 she had a rather severe cold, possibly influenzal in nature, and on two occasions in the following May sugar was detected, and again once in December last.

Case XI.—A male patient, aged fifty-two, suffering from a form of recurrent mania, with stupor and unpleasant delusions, which dates from adolescence. The intervals of comparative lucidity are very short, as a rule, and occur at extremely irregular intervals. Sugar was found on three consecutive occasions in June, 1903, during an insane period which lasted from early in the year until October 1st, and again, in small amount, on December 12th, by which date he had relapsed again.

In none of these cases, except perhaps the eighth and ninth, can any particular importance be attached to the glycosuria, and in none, again with these two exceptions, was any special treatment adopted. The last case which I have to describe is, however, a much more interesting one, and would appear to be an instance of genuine though mild diabetes,[a] occurring in the course of chronic nervous disorder:—

Case XII.—A male case of minor epilepsy, aged thirty-two, was admitted on February 11th, 1899, having suffered from this ailment since early adolescence, or possibly even longer. Shortly after his arrival he had an ephemeral attack of acute excitement with delusions, at first of an ecstatic character, but later very depressing, the whole lasting only two or three days. After this his mental state was one of mild depression, becoming more acute occasionally, as, especially, in June, 1899. Notwithstanding numerous varieties of treatment, the fits have, it may be stated at once, continued up to the present. They are mostly of a severe minor type, but occasionally there is a somewhat atypical major seizure. Sometimes there are intermissions of several days, or even a week or two, but usually one or two fits occur daily, and

[a] It should be stated, however, that this patient possesses a great fondness for sugar and sweets, and that the total quantity of urine passed in twenty-four hours has been less than normal whenever collected; nor has there been any excessive hunger or thirst noted.

it has generally been found that the patient is happier and better mentally when a moderate number occur regularly. For some time past the drug used has been mainly bromipin, which does not depress or inconvenience him, as do the alkaline bromides, and seems to be quite as effective for routine purposes. On one occasion trinitrin administered regularly greatly lessened the number of attacks when bromipin seemed to be losing its effect; but, unfortunately, the urine was not examined while this drug was being taken. There was, however, no sugar on February 17th, 1902. On June 2nd, 1902, trinitrin was again ordered, but, as melæna appeared, was stopped on the 5th. On the 11th sugar was found in the urine, and on the 12th the quantity excreted was said to be about 390 gr., but this was probably an over-estimate. At this period the patient became depressed, and continued so, with some alternations of excitement, for about a month. He was dieted, but the absence of sugar seemed to be adding to his depression, while not stopping the glycosuria, and after a few weeks the dieting was discontinued. From this time sugar has been present in varying amount in the urine almost without intermission up to the present—*i.e.*, for some twenty-one months. On January 6th, 1903, 131.6 gr. were excreted, and on this day he was put on 10 gr. doses of aspirin thrice daily, as that drug had recently been highly recommended for use in diabetes. Nine days later the output of sugar dropped to 11.7 gr., and on January 27th, it was 18.4 gr. Unfortunately, an attack of acute excitement (similar to that after admission, and to one which he had about the same date in 1902, but more protracted), which came on in February, necessitated the discontinuance of the drug. Its administration was not again resumed, as the diminution in the sugar excreted did not then seem to produce any mental or other improvement. In June, 1903, there was another, but slighter, attack of excitement, the sugar still persisting, though not in large amount. In July it was decided to try Poehl's cerebrin[a] for the seizures, which had been highly lauded for epilepsy, and this was accordingly given for about three months, during most of which time the patient had

[a] Also called phrenosin, and stated to be a cerebroside possessing the formula $C_{70}\ H_{140}\ N_2O_{13}$. It was first used in epilepsy by Lion, of Samara, on the theory that it might have an antitoxic effect on autotoxins specific for nerve tissue.

comparatively few fits, and was very well mentally, and the sugar in the urine was small in amount or absent. The drug seemed then to lose its effect on the seizures, and was discontinued until December 5th, 1903, when the sugar had reappeared. Since then it has been slight or absent, but the seizures have not benefited so much, and last February there was another attack of excitement, though not so severe as that in the previous year. The cerebrin has since been discontinued, but there is still only a bare trace of sugar in the urine. Comparing the periods before and after the appearance of the sugar in this case, we find that whereas there were only two attacks of insane excitement in the period of three years and four months previously during which the patient was under observation, there have been no less than four attacks in the twenty-one months since the sugar first appeared. Nevertheless, the patient's general mental state cannot be certainly said to have deteriorated more rapidly during the latter period, while at times, as in last August and September, he has been exceptionally well. Further, the number of seizures shows an actual decrease, for whereas the monthly average for nineteen months up to June 1st, 1902 (when sugar appeared), was about thirty-eight, the monthly average for nineteen months since that date has been only about twenty-five. The patient's physical health has not suffered, and he actually shows a tendency to put on weight.

Looking over the cases as a whole, the same preponderance of depressed states of mind is noticed as in the previous series. Of the twelve cases, eight were either cases of melancholia or were more or less depressed (owing, in most, to the nature of their delusions), while of the two cases of chronic mania, one was certainly not happy, and the other doubtfully so, and both somewhat demented. The remaining two patients suffered from advanced dementia. In all the cases, therefore, except perhaps the last, the glycosuria may probably be put down as alimentary, and due to the disorder of metabolism in the insane, as it has been found that the power of assimilating sugar is markedly diminished in melancholic and demented states.

In one of the earlier cases and in the last, a certain amount of mental depression may have been dependent on the glycæmia, but upon the whole the conclusion seems to be justified that provided glycosuria is transient it possesses no particular significance.

Finally, it may be pointed out for what it is worth that in nine of the cases the glycosuria appeared or commenced in the months of May and June, and in the tenth a second appearance took place in May.

A FATAL CASE OF MYXŒDEMA.

By HENRY C. DRURY, M.D. (Univ. Dubl.);
Fellow, Royal College of Physicians, Ireland;
Physician to Sir Patrick Dun's Hospital, Dublin.

[Read in the Section of Medicine, May 13, 1904.]

Mrs. M. A. K., aged forty-two, was admitted to Sir Patrick Dun's Hospital on the evening of the 29th of February, 1904, and died on the morning (3 a.m.) of the 4th of March, 1904, having been under observation only 3 days.

The following notes of her history, and condition on admission, were made by my resident pupil, Mr. M'Neight:—

"She says she had been confined to bed for the last 4½ months owing to general weakness. After 6 weeks in bed she got a good deal worse, and lay in a semi-conscious condition, passing both urine and fæces under her. At this time she got a bed-sore, which is still unhealed. She says she received no medical treatment till 3 days ago, when she was attended by a Jubilee nurse. Five years ago her right breast was amputated in a Dublin hospital. She has had 10 children. On admission the patient was in an absolutely prostrate condition, and almost powerless. Her skin feels extremely cold and quite dry, very tough and leathery. The skin over the abdomen is flaccid and wrinkled, and well marked with lineæ gravidarum. The subcutaneous tissue, which is fairly plentiful, feels hard and leathery, and unlike fat. The face is unmarked by any lines except under the eyes; the forehead, however, has strongly marked horizontal lines. The upper and lower eyelids are puffy, not very markedly so, but of a peculiarly soft, velvety feel, and of delicate semi-translucent or waxy appearance. The hollows at the sides of the nose are, to a great extent, obliterated. Her cheeks are plump and have a striking bright red colour, not due to flush, but to myriads of minute dilated capillaries. The lower lip is protuberant. The hair of the head is scanty for a woman of her age, somewhat thinned at the sides and above the forehead, and rather coarse in texture; the eyebrows are very thin and scanty; in each axilla there are only one or two hairs, and there is a very

scanty supply of pubic hair. There is great fulness of the angle between the neck and shoulder. Her hands have not a 'spade' appearance, and do not look swollen, but they are well covered, and she has had to have her wedding ring cut and enlarged, as it became too tight. The feet are so swollen that they look as if very œdematous, but they do not pit on pressure. There are numerous old sores on the feet and legs, due, we were told later, to burns from hot bottles. No thyroid can be felt. Her speech is extremely slow; she takes some time to answer questions, and it is difficult to get any information from her, but her speech does not seem thick, nor does the tongue look specially enlarged. Her movements are very slow when she moves at all, which is rare. She complains of great pain about the lumbar region of the back when she is stirred. It is difficult to move her at all, as she lies like a log in bed. Her heart sounds were inaudible, and neither apex beat nor pulse at the wrist could be felt. Though several attempts were made to take her temperature, even in the vagina, no result could be obtained with the ordinary clinical thermometer."

March 1.—I examined her on the morning after her admission and confirmed the above observations. She had slept only about two hours, and there was great difficulty in keeping her warm. She was conscious, but confused, giving different answers to the same question at different times—*e.g.*, she said at one time, that her breast had been amputated five years ago in one hospital; at another time, she said six months ago, in quite another hospital. The pulse at the wrist was not perceptible, but the heart could just be heard, and its rate was made out to be 52. The breast scar looked old and healthy; there was no appearance of new growth in its neighbourhood, nor any sign of enlarged glands or of new growth elsewhere. She was ordered tr. digitalis ♏ 10, tr. nucis vom. 7½♏ t.i.d., whisky ʒiv., and 1¼ gr. (½ of tabloid 2½ gr.) thyroid extract twice a day; hot bottles to be placed all around her, and any food she would take. In the evening a thermometer with low temperature scale was obtained. Repeated trials in the vagina, the instrument being read *in situ*, showed the temperature to be only 86° F. There was a very slight wheeze heard in her lungs all over, but it was so little that no importance was attached to it at the time. Her urine was scanty, but did not contain albumen.

March 2.—As yesterday evening advanced her mind became

more feeble, and wandered during the night. Her skin felt absolutely cold. The morning temperature was 85°, a pulse could just be felt at the wrist, and the heart beating at 56 per minute could, with care, be made out with the stethoscope. Her mind wandered continuously during the day. The wheezing had increased in the chest, and was now pronounced all over, and the breathing was more hurried. She was kept wrapped in hot blankets, and the same treatment which had been ordered the day before was continued.

In the evening the temperature had risen to 89.5°, and the pulse to 108, and was more easily felt. The skin felt warmer. She had passed no urine since the previous day, so a catheter was passed and fifteen ounces were drawn off. The bowels were relieved of a large constipated motion by enema.

March 3.—She was delirious all night, and towards morning passed urine under her. The temperature remained at 89.5°; the pulse could not be counted either at the wrist or at the heart. The breathing became much more laboured, and over the whole chest there was loud wheezing. She lay apparently quite unconscious.

Towards evening she appeared a little better except for the condition of the lungs, which caused real anxiety. Her skin felt a little less cold, her temperature remained at 89.5°, and the pulse could be made out to be 72. Still the breathing was very laboured, bronchitis was increasing, and she was profoundly weak.

March 4.—At 3 a.m. the night nurse gave her a little hot drink, the patient spoke to her, and the next moment she was dead. No *post-mortem* examination could be obtained.

Remarks.—This was surely an avoidable death, for it seems hardly credible that a woman, not even poverty-stricken, would be confined to bed for $4\frac{1}{2}$ months, in a populous district in Dublin, without the medical attendance which, on the recognition of her disorder, could have certainly restored her to health.

A bedsore occasioned her removal to hospital. The day of her removal was one of great severity, with high penetrating N.E. wind, and of extreme cold. The next day,

March 1st, opened with the same intense cold, high wind and copious snow falls. Probably it was this circumstance which baffled our attempts to save her life in hospital. Her low body temperature and profoundly enfeebled condition must have been seriously affected by the removal from her bed on such a cold day, with a drive in the ambulance of about a mile and a half to hospital. This was quite sufficient to account for the bronchitis which was noticed commencing the day after her admission, and which steadily progressed. The rise of temperature from 85° to 89.5° was probably an expression of actual fever in her case, and not merely a reaction due to treatment, as it was too abrupt and was not accompanied by any other evidence of improvement; indeed the time was too short to expect any such.

One could scarcely credit the reality of an internal temperature of 85° or 86° F., but it was undoubtedly so. It was repeatedly taken with the greatest care, the thermometer being placed in the vagina and read *in situ* as it was not self-registering. The instrument also was reliable, being a "Centigrade" used for laboratory work.

Murray, in his monograph on diseases of the thyroid, mentions a case in which a temperature of 77° was recorded, and one in which it was 63° shortly before death. In the present case, between 1 and 2 o'clock one night, a temperature of 82° was found, but it was not officially recorded at the time, and so is not included in the statement of the case.

The appearance of this case was very striking, as when first seen lying covered up in bed the face and head was like that of a big, florid country woman. Having heard just before entering the ward that neither temperature nor pulse could be recorded, the diagnosis suggested itself the very moment she was seen.

Her speech was the slowest and most deliberate we have

ever heard, and in spite of the fact that her daughter said she always spoke slowly to conceal a stutter, we have no hesitation in considering the extreme slowness to have been due to the disease. If she always spoke somewhat deliberately, an increasing slowness, taking perhaps years to develop, might easily pass unnoticed by friends who were constantly with her.

It appears that on more than one occasion while at home she had become delirious, and passed her evacuations unconsciously, so that her friends were not greatly surprised or much alarmed at this symptom appearing with us. It is probable that the bronchitis, with its accompanying respiratory embarrassment, was responsible for her death, by throwing such increased strain on the greatly enfeebled heart that it suddenly failed.

Cold is well known to have a disastrous effect on myxœdema; cases are always worse during winter, and especially on the colder days. In the past, before remedial treatment was known, the cases usually terminated by death during cold weather.

The extraordinary sensation of this patient's dry, harsh, cold skin, especially on the abdomen and round the loins, was very impressive.

Though we recognised the profoundly serious condition she was in from the first, we had such faith in treatment that we hoped for a more favourable termination, yet were not the least surprised to hear of her death.

The necessity of caution in commencing thyroid treatment was recognised also, and small doses were given. The supervention of delirium caused some misgiving as to whether the amount ordered might be too much—1¼ grain twice a day—but on learning that this symptom had more than once appeared while she was lying at home untreated, we considered we were justified in continuing without change.

THE PRESENT POSITION OF RADIUM IN THERAPEUTICS, WITH A *RÉSUMÉ* OF THE FINSEN LIGHT AND X-RAYS TREATMENT.

By C. M. O'BRIEN, M.D., L.R.C.P.I.;
Physician to the City Hospital for Diseases of the Skin and Cancer.

[Read in the Section of Medicine, May 13, 1904.]

In December, 1902, I had the honour of reading a paper before this Academy on a year's experience of the Light Treatment, in which I described my method of applying both the Finsen Light and X-rays, discussing in brief the conditions in each case which appeared to me favourable to the adoption of one or other or both of the methods. I found it difficult then, and it would be much more difficult now, to discuss either method separately, for in the general routine of hospital non-selected cases the two methods of treatment markedly overlap, and with best results.

Times beyond count the physician is confronted with the crux, "which method should I employ in this new case, the Finsen Light or X-rays," and frequently the question founded on experience irresistibly suggests the answer, "use both." In all such cases (and they are many, especially in lupus), needless to say, sentiment and hero-worship must be suppressed, and the best method, or a combination of the best methods, only employed in the interest of humanity.

In the discussion that ensued on that paper it was suggested that I should again bring forward the cases then exhibited, and in compliance with that suggestion I have the honour of now submitting for your inspection a few who were within easy reach, while holding written replies of a reassuring nature from most of those who have returned to the Provinces, where they are at

present pursuing their avocations on terms of equality with other members of the community—some after a lapse of 28 years.

Case I.—A girl, aged twenty-four.

Condition on Admission to the Skin Hospital in May, 1902.—She presented an extensive yellowish dark incrustation, involving the alæ nasi, tip and bridge of nose, the prominence of both cheeks and greater part of upper lip, the nasal cavity being much encroached upon by lupoid vegetation. The lupus was of four years' standing. She had been operated upon four times under chloroform prior to her admission to the light treatment. She received the Finsen Light to the face, and X-rays exposures to the nose.

Case II.—A girl, aged thirty-one.

Condition on Admission to the Skin Hospital in December, 1901.—The lupus had involved both cheeks, with considerable destruction of the alæ nasi and septum. Connecting the patches on both cheeks a band of ulceration, horse-shoe in shape, was perceptible, involving the greater part of the bridge of the nose. The disease was of 16 years' standing, and had been surgically treated twelve times before her admission to the light treatment, which included both the Finsen Light to the face and X-rays to the nose.

Case III.—A girl, aged twenty-one.

Condition on Admission to the Skin Hospital in April, 1902.—She presented a small, well-defined ulcer involving the right ala nasi, and extending up the right nasal cavity, the mucous membrane of which was swollen, granular, and bled easily. The lupus was of five years' standing, and had been operated on four times under an anæsthetic prior to her admission to the light treatment. She received both the Finsen Light and the X-rays.

Case IV.—A boy, aged thirteen.

Condition on Admission to Skin Hospital, December, 1901.—He presented a circular ulcer, something larger than a shilling, situated on left cheek. The edges of ulcer were infiltrated, and its base contained typical apple-jelly nodules. The disease was of nine years' duration, and had been surgically operated upon under anæsthetics six times before his admission to the light treatment. He received the Finsen Light only.

Of the foregoing cases presented to you for re-examination, and whose histories were given in greater detail, with illustrations, in my former paper, no treatment has been given for nearly a year, with the exception of Case I., in whom the disease recurred in the mucous membrane of the nose, and to whom the high frequency current is at present being applied.

The foregoing *résumé* of the light treatment brings me to the subject of my present paper—Radium—the latest therapeutic remedy upon which medical science has been called on to adjudicate. This remedy has already received so much notoriety in the lay Press that I consider it both opportune and necessary that its therapeutic results should be recorded at once with accuracy by operators who have tried it, and whose method of procedure has been open to the inspection and investigation of the profession. We may thus spare public feeling the pain of disappointment, so often the outcome of sensational exaggeration, while at the same time safeguard from disfavour, and probably disuse, a method I believe we are justified in assuming is full of promise.

I will not tire you with the history which led to the discovery of radium, and with which the names of Madame and Monsieur Curie are so inseparably associated. But what appears to me the most characteristic feature associated with it and with most of the great discoveries of our own times is the sequence with which the one led up to the other, compelling Nature, as it were, to divulge her secrets, while at the same time serving as finger-posts to future research.

In 1882 Koch discovered the cause of consumption, and eight years later he declared he had found its cure by injecting tuberculin.

In 1894 Finsen, after years of patient experiment, pro-

claimed that by concentrating certain rays of the solar spectrum he could kill the bacillus which Koch had found but failed to conquer.

In 1895 Röntgen convulsed all Germany, and indeed the scientific world generally, by his statement that he had discovered rays which were not only curative, but could render the human body transparent.

In 1896 Becquerel discovered that uranium emitted rays akin to Röntgen-rays, but weaker, and it was doubtless this important link in that chain which led to the discovery of radium by the Curies two years later.

I shall not dwell on the physical or chemical properties of this great metal, excepting so far as they apply to practical medicine. The power possessed by radium of emitting rays which manifest different penetrative and therapeutic effects is the one property of all others which most strongly appeals to the physician. Whether or not these rays are identical with X-rays is a matter upon which much diversity of opinion at present exists. I am indebted to Dr. Reginald Morton for a copy of a paper kindly sent me in which he discusses this difficult and important question most clearly and concisely.

An approximate knowledge of the penetrative power of radium rays may be obtained by the ordinary X-ray screen in a dark room. My own specimen of 5 milligrams—all I could possibly procure last September of a reliable standard—when held half an inch behind a bar of metal $1\frac{1}{4}$ inch thick, caused distinct fluorescence of the ordinary X-ray screen, and when held at a distance of three or four inches behind the screen, and the hand was then interposed between the radium and screen, the general contour of the hand became manifest, but to a much lesser extent than in the case of X-rays. These experiments are not only interesting, but easy to make.

Unfortunately, the supply of radium is so limited that even in the out-patient department of large skin cliniques much difficulty is experienced in procuring suitable cases for this method of procedure. Hence operators are precluded even now from dogmatising on its therapeutic merits.

The method and duration of its application were additional difficulties which early workers had to encounter, and the difficulty in definitely fixing a period of application which will apply equally to all is well illustrated in the history of my cases given below. Where different patients with like disease, similarly situated, had the same specimen of radium applied under like conditions to patches of lupus of equal size and depth, which had not been previously treated, in one case twenty applications of ten minutes' duration were sufficient to establish a cure, while in the other twenty applications of ten minutes' duration were insufficient to create any alteration excepting slight redness and itching.

It may be that personal susceptibility of a patient, so important a factor in the Finsen Light and X-ray methods, may also have to be reckoned with in the treatment by radium-rays.

Case I.—A male, aged thirty; unmarried; clerk. Has been the subject of extensive lupus of the face for twenty years, during which time he has been applying nitrate of silver and other caustics weekly, and has had it scraped under an anæsthetic seven times. He is at present receiving both the Finsen Light and X-rays, and is steadily yielding to this course. About two years ago he developed a patch the size of a sixpenny piece over right eye-brow, close to the orbital margin and inner angle of the orbit. The patch was circular in shape, with irregular edges which were slightly raised above surrounding skin, and capped with a yellowish crust in centre. The position at once suggested treatment by radium because of the extreme difficulty of applying either the Finsen Light or X-rays.

On December 16th, 1903, having removed the crust, I

applied, in close apposition with the patch, 5 milligrammes of radium bromide in a vulcanite capsule with a circular window of mica, for the easy transmission of the radium rays.

From Dec. 16th, 1903, to Feb. 10th, 1904, he had in all 20 applications of ten minutes' duration. Nothing perceptible had occurred in the progress of the case until the end of the 5th week, when the edges of the patch became more prominent, slightly redder, and an itchy sensation was complained of, with a slight discharge from the patch for the first time.

The further treatment was persisted in, and five additional applications given of the usual duration, and at intervals as before.

On Feb. 10th, the date of last application, the edges of patch were more swollen and redder, and although the itching had practically ceased, the patient complained of stiffness of the muscles, which became more manifest on wrinkling the brow. The discharge referred to before, meantime, increased. The treatment was now stopped, swelling and discharge subsided, and in three weeks later the patch, although still red, had assumed the appearance of a healthy scar. No external applications of any kind were applied prior to, during, or since the treatment above described.

Case II.—A girl, aged sixteen, was admitted to Skin Hospital, Dec. 21st, 1903, having suffered for about seven years from a patch of lupus, the size of a sixpenny piece, of a reddish colour with raised edges, covered with branny scales. Patient suffered no pain. She sought treatment now only because she thought it was beginning to spread, and becoming more unsightly. On Dec. 21st, 1903, five milligrammes of radium bromide were applied in direct contact with patch, there being no discharge from sore in this as in the former case which could in any way diminish the radio-activity of the specimen employed. Between Dec. 21st, 1903, and March 18th, 1904, sixty-one applications were given. 1st month—five applications weekly, of ten minutes' duration, without manifesting any visible change excepting a slight redness. 2nd month—twenty applications of thirty minutes' duration were given, the redness of margin becoming more pronounced, accompanied by itching, but no discharge. 13th Feb., duration of application was increased to 45 minutes, of which 15 such

applications were given, with the result—the edges of patch became swollen, with the sensation of pins and needles in part, and a discharge on pressure. The treatment was still continued, and six further applications were given of 60 minutes each, the last on March 18th, when the treatment was stopped. A week later the pain, swelling, and discharge had diminished, the base of ulcer was clean and healthy looking, but the edges somewhat raised. No treatment or external applications of any kind were applied prior to, during, or since the treatment mentioned.

Concluding Remarks.—Radium, to be of practical use in the cure of disease or the alleviation of human suffering, must be forthcoming in much larger quantities, of a recognised standard of activity, and at a very much cheaper rate. From my own experience of the metal I prefer to detail what I have already achieved and how I achieved it, rather than to express an opinion on its merits which might in any way circumscribe its sphere of application or prevent others from putting it to the test.

For diagnostic purposes it is very doubtful indeed if radium can ever be of much use. With the X-rays we have much grounds for hope in both lupus and rodent ulcer, and, combined with the Finsen Light, the results recorded are becoming more universal and more reassuring.

In my previous paper I expressed the belief that the Finsen Light for circumscribed superficial lupus had no equal. Now, after eighteen months' further experience, I am more convinced than ever of its efficacy. But it will be for you to say whether or not I have claimed for the method more than my results justify.

NOTES ON A YEAR'S ASYLUM WORK.

By W. R. DAWSON, M.D., F.R.C.P.I.;
Medical Superintendent, Farnham House, Finglas, Co. Dublin.

[Read in the Section of Medicine, May 13, 1904.]

In the following notes some of the more interesting points arising in the practice of the year ending March 31st, 1904, are briefly touched upon.

Causation.—Ascertained hereditary diathesis played a less important part than in previous years in the causation of the cases admitted, in only 50 per cent. of which it was known to be present, as against 78 and 73 per cent., respectively, for the last two years. But in addition to this there was one case in which the point was not ascertained, while in another there was a tubercular heredity. These have not been counted. An epileptic voluntary boarder had a collateral heredity of epilepsy. On the other hand, the cases in which neuropathic diathesis was the leading factor are nearly equal in numbers to last year, representing about 35.7 per cent. of the whole; while wear and tear, mental and physical, account for nearly 42.9 per cent., and toxic influences for 21.4 per cent. A certain amount of overlapping of causes took place as usual; but, upon the whole, the toxic factor was less prominent than in previous years—indeed, it is doubtful if one toxic case, supposed to be due to influenza, which is included in the above numbers, can rightly have this origin ascribed to it. On the other hand, some would doubtless place the case of epilepsy under this heading, not only because epilepsy is possibly due to a toxæmia, but because in this particular instance the disease arose after a severe

attack of measles in childhood. It will be seen from the above that the prevalent factor is again wear and tear.

Forms of Mental Disease.—An unusual feature of the admissions was the very large proportion of cases set down as mania, as there seems to be an opinion abroad that this form of insanity is not now so frequent as formerly. No less than 50 per cent. of the cases admitted—over 63 per cent. of the certified admissions—might be so designated, though less than half of these were cases of ordinary uncomplicated mania. Somewhat less than one-half recovered rapidly during the year, and two cases of mania from the previous year also were discharged, one recovered, the other—a hopeless case, it is feared—improved somewhat. Melancholia accounted for a further 2 per cent. (nearly) of the admissions, and the remainder were cases of dementia and paranoia. A voluntary boarder, who suffered from epilepsy, was not insane, but somewhat childish for his years.

Acute Attacks in Chronic Mental Disease.—Another feature of the year was the number of cases in which acute psychosis occurred in the course of more chronic mental malady. Of these, one case of mania appears to have been somewhat imbecile always.

Case I.—She was a girl of twenty-seven, with bad heredity, admitted early in the year, and seems to have displayed from childhood many of the stigmata of a neuropathic diathesis (eccentricity, excitability, and impulsiveness, want of persistence in anything she took up, &c.). She was able to live at home, however, until a love affair upset her mental balance, when she made persistent efforts to run away. This, and her total inability to appreciate social conventions, led to her being sent here. After about five months she had so far improved that it was decided to try her outside, but she soon succeeded in running away again (on one occasion attired only in a quilt over her night-dress), and had to be sent back, when she showed a good deal of excitement.

Since then she has quieted down, but it is feared that her thoughts still run continuously on her engagement (notwithstanding a somewhat brutal letter from her former *fiancé*), and that it will not again be possible to discharge her.

One point about the case is that she possesses considerable musical ability, a talent by no means incompatible with general mental weakness.

The following case is in some respects similar, though differing completely in others:—

Case II.—A woman of forty-seven, with bad heredity, admitted as a voluntary boarder last summer. As a child she had been peculiar, and at eighteen she had an attack of insanity, lasting about a year. Since then she appears to have been hovering on the verge of insanity, and sometimes over it, and to have proved a perfect thorn in the side of her relatives owing to her vagaries. Her physical health was excellent, but she considered herself nervously "run down," and detailed a number of more or less delusional experiences. She proved an unpleasant inmate, being selfish, discontented and delusional, with mental weakness. After about two months she left, but soon returned, and got on, on the whole, better until about the beginning of 1904. Her delusions then became more prominent, she grew very erotic, and at the same time suspicious, and finally was so excited that, with the consent of her relatives, she was certified last January. Since then she has been in a state of acute mania; but, as a rule, her delusions are of an unpleasant type. She has hallucinations of sight and hearing, and during the first days of the attack complained of a constant smell of blood.

Dementia Præcox.—It is not altogether improbable that the last case is one which German writers would class as an example of dementia præcox. The following, however, up to a certain point showed an almost typical symptomatology, and only the future course of the case can determine whether it is a true example or not:—

Case III.—The patient, a young man aged twenty-one, student, was admitted last February. There was some neuro-

pathic heredity, but not very intense, and also some family tendency to tuberculosis. He was well-developed, muscular and intelligent looking, and when at school was an athlete, but gave this up on leaving and had worked absurdly hard—12 hours a day at times—at books up to about two years before. He then broke down at an important examination, but before this he suffered from temporal neuralgia, *muscæ volitantes*, and loss of conscious affection for his relatives, all of which persisted ever since. He continued to do a good deal of reading and other intellectual work, and held a post for a time which exposed him to high-pressure religious emotionalism. Last autumn he began to suffer from "hysterical" attacks, laughing and crying. By the advice of Sir W. Gowers, he then tried farm work for some months, but without getting rid of the feeling of mental dulness which oppressed him, and which, according to himself, rendered him incapable of reading or remembering anything, or of following a conversation. He also complained of bodily numbness. In January and February he had three mild and short maniacal attacks, and at such times the feeling of "numbness" left him and his memory returned. In the last, just before admission, he was found on the floor in a cruciform attitude. He came voluntarily, and for some weeks seemed to improve, joining heartily in the life of the institution, and playing hockey and other games. The latter had to be partially stopped, however, as he said he felt worse after violent exercise. He continued to suffer from neuralgia from time to time, but sleep and appetite were good, and his general health excellent. The treatment was mainly tonic. About a month after admission his mental state rather suddenly became worse, and his blood-pressure was found to be high. He was put to bed, and as he seemed better there, was kept in bed for a week and fed up. For the first few days he improved. His blood-pressure fell to normal, and sensibility to pain (which was decidedly blunted—that for touch and heat and cold being unaffected) became again acute. Towards the end of the week, however, he began to show signs of delusion, complaining that the noises of the birds seemed to have a symbolic meaning, and later he became somewhat elated. He then developed the delusion that he was dead, and laid himself out accordingly; and when obliged to get up he walked stiffly sometimes and attitudinised. There was a good deal of stupor for some days, varied

with hysterical ecstasies, laughing and crying. Finally, about a week later, he suddenly became acutely maniacal and violent, with delusions, sleeplessness and refusal of food, necessitating seclusion and hydropathic treatment.

In this case the heredity was not so bad as is usual in dementia præcox, and it may be that the case is merely one of the insanity of overwork, a much more uncommon occurrence than patients and their friends would have us believe.

Recurrent Cases.—As mentioned in the notes for 1901-2, recurrence is one of the commonest manifestations of hereditary diathesis. It was a feature in the second case just described, and also in several others admitted during the year.

Case IV.—A lady, aged sixty-five, admitted last summer, suffering from acute mania, which varied from a silly elation with constant chattering (chiefly on matrimony and love-making), and interference, to ill-temper and abusiveness. She had been treated here for previous attacks, which seem to have been of the same character, in 1873–75 and 1879–83, since when she had two attacks at home. She is probably permanently weak-minded.

Case V.—Gentleman, aged fifty-three, a man of means and position, whose family relations were unhappy, owing to his misconduct. He had a fall on his head in 1886, and since then has had a large number of maniacal seizures, in which he is tricky, mischievous and inquisitive. The attacks usually last six or seven months. He was brought here temporarily, an attack having come on suddenly when he was on a holiday in Ireland, but he refused to leave, and made a good recovery in about two and a half months, showing only a little reactionary depression before he left.

Cases such as these, even when they do not become permanently demented, are very unlikely to enjoy continued mental health, although the prognosis as regards recovery from any individual attack is usually good. The last

improved by arsenic, which rather seems to show that the sensation is not entirely hallucinatory. There was no tenderness of skin or muscles on admission, but possibly some chronic degenerative process in the nerves, due to alcohol, may account for the phenomena alluded to. A trace of some reducing substance was present in the urine on admission, but not since.

An old lady, who had been in the institution for many years owing to alcoholic mania and later dementia, and had been tried in a private house on probation, was considered well enough to be discharged, and has got on satisfactorily outside.

The case of *chronic morphinism* described in last year's notes (Case VII.) was discharged last August after some ten months' residence. He has since been doing work outside, and by all accounts, and also judging from his appearance, remains well.

The following case deserves separate description:—

Hallucinatory-confusional Insanity.—CASE VII.—The patient was a professional man, aged fifty-eight, with a good heredity. He was hard working and anxious, and suffered from dyspepsia and insomnia. For the latter he had for about 30 years been accustomed to take chloral hydrate, and two years ago, by the advice of a leading medical man, he began to use daily doses of nepenthe on account of what appears to have been mild mucous colitis, a condition which caused him a good deal of pain at times in the lower part of the abdomen. For two years he had been unequal to any continued mental effort, and became irritable, listless and forgetful. Two months before admission he began to act strangely, became restless and delirious at night, and imagined he saw gypsies in his room. He then developed incoherent delusions about his house being undermined and inhabited by improper people, and the like. He was taking large quantities of chloral, nepenthe and alcohol at this time, and his physical state was so bad that it was clear he could not live long unless some change was made. At times, however, he would be fairly sane.

On admission in the middle of November last he expressed a number of delusions of the same kind. He was very thin and muscularly weak; but there did not appear to be any organic disease, except, perhaps, some gastric dilatation and dyspepsia, for which he had to be dieted very carefully. He was unable to remember names accurately, but invented them. He slept very little, and suffered greatly from hallucinations, especially at night, which seemed to have the character of waking night-mares; one in particular was a "sulphur chamber," in which he believed himself to be placed for treatment. He also suffered a good deal from abdominal pain and from constipation. Strychnin, $\frac{1}{40}$ gr., hypodermically was given thrice daily, mild sedatives (of which paraldehyde with bromide proved most effective) at night, and he was encouraged to take open air exercise to a moderate extent. He soon was taking a fair amount of food, and the delusions and hallucinations speedily began to pass away, and were practically gone in a month. He only once or twice got a small dose of nepenthe, and there were no abstinence symptoms, properly so-called. The bowels were attended to, but the pain, which latterly came on at the same hour every night, kept him from sleeping, and it was clear that he would not have self-control enough to keep from chloral. Early in January, however, it was resolved to try quinine salicylate, of which 5 gr. were given every night at bed-time. From this time the pains began to disappear, and were soon completely gone—a most satisfactory result when one remembers that they had resisted all treatment for two years. The patient rapidly gained ground and was discharged recovered in about two and a half months. He has since (except for a very short period) remained well in all respects, and is able to eat food which for years he could not have touched.

The case is, therefore, a typical instance of the "hallucinatory-confusional" variety of insanity which is characteristic of toxic action of all kinds. The cure in so simple a way of so refractory a complaint as mucous colitis (if this was really what was wrong, which seems probable) was, to say the least, highly satisfactory.

Epilepsy.—Two cases of minor epilepsy (with occasional

atypical major fits) were under treatment during the year. One, which has been in the institution for some time, has already been alluded to. In July last it was decided to try Poehl's cerebrin, and the effect for about two months both on the number of the fits and the mental state was so excellent that hopes of permanent benefit were excited. It seemed to lose its effect then, however, and though the administration has been since repeated, the same marked results were not again obtained. One very definite effect which the drug always produces, however, is the reduction of the amount of sugar, which the patient has constantly excreted for the past two years, to an infinitesimal quantity.

The second case is more satisfactory:—

CASE VIII.—A young man of twenty-four, with some epileptic and neurotic heredity. When thirteen he had severe measles, with convulsions and unconsciousness, and about a year later he developed minor epileptic seizures, which lasted up to admission and for some months later. They were generally slight and short, and latterly he had one or two daily—usually, but not always, in the morning. In the spring of 1903 he had a sharp attack of pleurisy. He appeared to be becoming weak-minded, and was (and is) decidedly youthful for his age. Before admission he was treated with bromipin, alkaline bromides, trinitrin, cerebrin, and dieting, with some improvement of the general state, but not much effect on the fits. Cerebrin was again tried without result after admission, but this was stopped in about six weeks, and potassium bromide with digitalis ordered, which has been kept up practically ever since. (A diet free from meat has also been given.) About a month later the fits began to decrease, and he has had none during the first three months of this year. As there have been long intermissions before, however, it is not quite certain that the attacks may not return.

Physical Disorders and Symptoms.—Two of the cases admitted, both emotionally somewhat depressed, were found to be suffering from organic heart disease, and in eight others there was some cardiac weakness without

actual disease. Every case except one had some bodily disease or disorder, which once more emphasises the fact that mental symptoms very seldom go alone. None of the new cases showed albuminuria, however, which was found in three of the old cases, in one to a very serious degree, the albuminometer reading 2, 3, or even 4 per cent. for months. This was the case of an old paranoiac with unpleasant delusions, in whom the disease developed insidiously. All the albuminuric cases were mentally of a depressed type, which accords with our previous experience.

A case of colitis has already been dealt with.

A further study of a number of cases in which *glycosuria* occurred has been made.[a] It includes the results of some observations during the year under review, but these need not be further touched on here.

Blood-pressure was recorded in a few more cases, but was found to be normal, except in that of dementia præcox already described.

The *general health* of the institution has been good.

Treatment.—No case occurred during the year in which the regular *thyroid* treatment seemed to be indicated, but small doses were given as usual in a case of recurrent melancholia in which the drug had been found of use before. Although it did some good, the results were on the whole not so satisfactory as previously.

Suprarenal administration was tried for some time in Case II. without result.

Cerebrin was given in a case of paranoia with periodic attacks of violence, as suggested by Lion, as well as in the two cases of epilepsy above mentioned. In the former it undoubtedly appeared to do good for a time, but latterly seemed to be losing its effect.

[a] Med. Pres. and Cir. May 4, 1904.

Arsenic was administered freely in four cases, one of which has already been dealt with. In a second, one of stuporose melancholia described last year, it led to the most marked bodily and mental improvement which has taken place since admission, but the latter has unfortunately not been permanent.

Lecithin and *Magnesium Dioxide* were each tried in two cases without much result; but of course the number of cases is too small to be of any value.

Other points of treatment deserving notice have already been dealt with.

SECTION OF SURGERY.

THE CLINICAL AND SURGICAL ASPECTS OF CANCER WITH A VIEW TO EARLY OPERATION.

By SIR LAMBERT H. ORMSBY, M.D.;
President of the Royal College of Surgeons in Ireland;
President of the Surgical Section of the Royal Academy of Medicine in Ireland.

[Presidental Address delivered November 13, 1903.]

At no time in the progress of Surgery has the question of malignant disease been so fully and widely studied as now, as regards its causation, progress and cure. Being a member of the Committee of the Cancer Research Fund, whose headquarters and central laboratory at present are at Examination Hall, Victoria Embankment, London, I have had exceptional opportunities of learning what has been done, and what is proposed to be done in the near future, by the Committee, from the General Superintendent, Dr. E. F. Bashford, and his able assistant, Dr. J. A. Murray, the active experts who have been appointed to grapple with the important problem of the causation of cancer. And when I say cancer, I mean all forms of malignant disease.

Of recent years, owing to the great advance made in our knowledge relating to pathology, histology, and bacteriology, a clinical worker is rather prone to depend too much on the microscope and other means of scientific precision rather than on the knowledge conveyed by the hand and the naked eye of the local appearance of the diseased area

alleged to be affected. The pioneers of our profession in days gone by, in the absence of all the present scientific instruments of research, so useful and yet at times so misleading in the diagnosis of the various growths and enlargements in different parts of the body, believed themselves able, by constant observation and long experience, to accurately distinguish at a glance between malignant and benign growths by such means and conditions as :—

1. The physical inspection and palpation of the part.
2. The rapidity of growth, or the reverse.
3. The amount of pain present.
4. The mobility or adherent nature of growth.
5. The implication of glands in the immediate neighbourhood of the growth.
6. The appearance of the patient, whether gaining or losing weight, and whether suffering from that particular form of cachexia so common when malignant disease has been present in the system for any length of time.

I fear nowadays we train our students to rely too much on the scientific assistance they receive in the histological laboratory, and to neglect the long and close observation in wards and out-patient departments of hospitals so necessary in clinical investigation, in fact, throwing away the substance for the shadow.

I wish to say, however, that it must be clearly understood that I do not decry in any way the close study of pathology, histology, or bacteriology. But what I consider to be the proper sequence of study is first to inquire into all the clinical and naked-eye appearances of a growth as regards its progress, history, supposed causation and environment, and when these facts have been accumulated, crude though they may be, then to seek the further assistance of the microscope and other means of scientific investigation. Over and over again I have found distinguished

microscopists differ as regards the nature and structure of a growth submitted to them for examination. Again, I have at times found that growths have been declared malignant or benign as the case may be, and the subsequent history and clinical progress proved beyond all manner of doubt that the opinion given was erroneous.

A great effort is now being made to penetrate the darkness in which cancer has hitherto shrouded itself. The different research committees in Europe and America are bravely endeavouring to arrive at the true solution of its causation, and if their crusade against the dread enemy prove successful, what benefit must accrue to mankind! There is scarcely a home, rich or poor, that has not directly or indirectly suffered from its ravages, but if the great problem of its causation were solved I feel certain cancer could be prevented, "and if preventible, why not prevented?" in the words of His Majesty the King.

The consideration of the question as to how these new growths arise has exercised the minds of the most distinguished experts the world over, and theory after theory has been built up in the vain hope of solving the problem, and cause after cause has been assigned as the true instigator of the disease in this exhaustive study.

We must first consider that in ideal life the cells comprising the essential and living elements in each organ of the body form an harmonious, ever-busy community, active for the welfare of the body as a whole. In accordance with the dictates of biological laws assigning to each and every member a special field of usefulness, there exists a mutual understanding of give and take among the members of the cellular commonwealth. Cell is dependent on cell, organ on cell and cell on organ, in one way or another. In their several spheres some cells are more active, others more passive, but the difference in activity involves no

subjugation of the passive members to the assertiveness of the more active.

Various agencies may upset the states of equilibrium described, and the result is disease. The agencies causing disease may come from without or arise within the organism itself. In regard to most diseases we have no difficulty in ascertaining whether the agency responsible has entered from without or has arisen within. There is, however, one exception, for the nature of cancer still remains a great enigma. In cancer the harmonious equilibrium of cell life is sadly upset, and there are no certain indications whether the cause is to be sought within or without the body, whether it has been acquired during life or was present at birth. The equilibrium of cell life appears to be disorganised in consequence of the unwonted activity of certain members of the community, and we do not know whether the cells responsible are normal cells curiously modified, or cells which had never any business to be where they occur. Neither do we know what the cause of this unusual activity is. The individual efforts of the greatest medical experts have not sufficed to provide a satisfactory explanation. Medical investigation during the last fifty years has resulted in the accumulation of many important facts relating to cancer and its consequences, without, however, an adequate explanation of the various phenomena being arrived at.

Cancer is insidious in onset, tedious in duration, fatal in its issue, and singled out from other diseases by various characteristics. It proceeds surreptitiously till far advanced, and all too frequently the signs which first arouse attention are its consequences. Any signs which are produced are not of themselves the symptoms peculiar to cancer. Only by a reasoned exclusion of other diseases can the presence of cancer be diagnosed by the medical

man. It is, therefore, not a disease which suddenly attacks the whole body simultaneously, nor one which at once incapacitates its victims. This is because it starts from small beginnings in one limited area, rarely in more than one area. How small the original cancer area may be we do not know, nor whether a group of cells are the parent sources of the mischief, or one single cell the egg from which the awful brood is hatched. However this may be, the cancer is at first limited to a localised area, and within it the germs are confined from which all the subsequently developed cancer is directly descended. The cancer patient's hope lies in the fact that if the surgeon can operate early enough while the cancer remains localised, he can cut it out and relieve the sufferer, if operated on extensively.

Considered generally, cancer is a process in which a colony or colonies of cells grow and multiply, heedless of the interests of the organism in which they serve no useful purpose.

These cells invade regions of the body to which normally they are strangers, and appear to be concerned only with their own aggrandisement and regardless of the consequences. The world in which alone these cells can have their being is a living organism: yet regardless of their own, and of the vital interest of all other cells, they disorganise the machinery essential to life. They ultimately wreck and are themselves involved in the ruin of the community, or rather world, of which they form a part. Can any process seem more purposeless? What have the cells afflicted with the chaotic activity of cancer effected? Their own destruction and that of their host; but nothing that is even to their own advantage.

The unnatural cell multiplication and activity which has been outlined is the peculiar feature of cancer. Cancer

is a generic term, and for the investigations of the Cancer Research Fund includes all types of what are distinguished as malignant new growths, to the exclusion of other forms of cell multiplication and activity, such as are met with in the repair of an injury, in hypertrophy, or in the formation even of what are known as benign tumours. The term tumour is not really a synonym for cancer, but is one applicable to all sorts of swellings and lumps. There are some tumours due to purposeless cell multiplication, which, however, never invade other tissues, but remain more or less localised growths, and are, therefore, known as benign new growths or cancers proper. The adjective "malignant" sums up in one fell word the ruthless, destructive nature of these new growths, the cells of which proliferate as before described, and, regardless of consequences, invade by direct extension the tissues among which they have had their first seat, and even give rise to fresh new growths in organs remote from the original seat of the disease.

The invasion of the tissues among which a malignant new growth is situated takes place by infiltration of cancer cells between the healthy surrounding cells; it must be distinctly understood that the latter do not become cancerous—they are merely passive sufferers under the cancerous activity of other cells, and may suffer from being pressed together, cut off from their blood, and therefore food, supply; it has even been stated that the cancerous cells attack the surrounding cells directly, and, cannibal-like, devour them, or by excretion of noisome influences cause the surrounding cells to retire or disappear before their advance.

It is obvious that the invasion of surrounding tissues by infiltration will have serious consequences whenever a vital organ, an important nerve or vein, is involved. The

malignant new growth which first develops is said to be the primary cancer, and the site at which it arises is called the primary site. The primary growth may enlarge locally in the way described, or by continuous extension of the process of infiltration come to involve tissues at some distance from the point of origin, especially when the extension proceeds along the lymph channels. Thus transported daughter colonies of cancerous cells develop as secondary malignant new growths in secondary sites. Extension or, more correctly, dissemination of a malignant new growth may also occur in a somewhat different way, and at any stage in the development of the primary growth. Malignant new growths require nourishment like any other tissue, and are, as a rule, plentifully supplied with blood-vessels, some of which have developed along with the cancer. If a few of the cancerous cells of the primary growth find their way into one of these blood-vessels, the cells are carried by the blood-stream, or if they have found their way into lymph spaces by the lymph stream to a distance, they find a resting place in new sites and in remote organs. The cancerous cells which are thus transported also develop into daughter colonies, as secondary malignant new growths in secondary sites, and without any direct connection with the primary growth.

Much attention has been devoted to the question of the manner in which cancer extends, in order that the distinction between this process and what is known as infection in other diseases may be readily comprehended. In the infection of living cells by a parasite or virus of any kind known to us, the infection extends by transference from cell to cell of the infective agent.

Cells transported or transplanted from the primary site of the disease can only be responsible for daughter infections if they at the time are also vehicles containing the

virus in a form which will permit of the latter finding exit from its vehicle and primary host into a new cell.

Thus, in all the infections and parasitic diseases known to us, the process of extension is something very different from what occurs in the case of cancer, where the cells involved are all the direct genealogical descendants of those first afflicted. If a primary cancer of the liver give rise to secondary cancer in the lung, in the bones, in the kidney, to put it grossly, they are simply bits of atypical and not a typical liver growing in the liver itself, and lineal descendants in the lungs, bones and kidneys, with dire consequences alike to them all. We do not know whether the process originated in normal liver cells becoming abnormal, or in the presence at the outset of cells which had always been abnormal, and never really a part of the liver itself.

Cancer may have its primary site in any tissue or organ. The primary site is of importance in determining the form which the cancer will assume, for a cancer is always a more or less perfect imitation of the tissues in which it is first found growing. Indeed, cancers are classified according to the tissues which they most nearly imitate. For us it is sufficient to state that the two great groups of cancer are those in which the higher epithelial forms of cell development are present, and those in which the less differentiated connective tissue forms of cells are imitated.

The former are known as carcinomas, and the latter as sarcomas.

From what has been said, it is clearly the bounden duty of the surgeon, the moment a suspicious growth or tumour is discovered, to advise its immediate removal. There is no use in waiting for further evidence of malignancy. The sooner the tumour is extensively excised the sooner the danger is removed from the patient. Clinically, one

finds slow-growing and quick-growing cancers. No two malignant growths run exactly the same course. But we know that slow-growing cancers give the better results as regards non-recurrence after removal than rapid-growing cancers. There is no doubt that a large part of the success of operative surgery in malignant disease depends on early diagnosis and early extensive removal.

On this subject Mr. Butlin says:—"Hence the supreme necessity for a continued and active study of the diagnosis of malignant disease in every part of the body, and not only of actually existing malignant disease, but of the conditions which precede the occurrence of malignant disease, predisposing conditions and pre-cancerous stages."

Early diagnosis is not always followed by early operation, for sometimes it is almost impossible to persuade the patients or their friends to allow an immediate operation to be performed because they feel no pain or inconvenience in the part, and have no idea of the danger of postponement as being the means of destroying the very best chances they have for its removal and non-recurrence when removed. In other cases a tumour may be overlooked for a considerable time and is only discovered by accident when it has assumed considerable dimensions and is attended with secondary growths and glandular contamination.

In the report of the Cancer Research Fund the figures for some 3,000 cases of malignant new growths are given, and are tabulated in such a way as to compare the clinical diagnosis with the result of the pathological examination made after operation or *post mortem*. These figures, while on the one hand they bring into prominence the difficulty and in many cases the impossibility of diagnosing the presence of cancer, also show that surgeons recognise the importance of early diagnosis. In this report the cases

of malignant disease are divided into two groups, accessible and inacce sible, and attention is drawn to the large number of "accessible" cases which the surgeon in the interest of the patient has diagnosed as malignant new growth, which subsequent pathological examination has not confirmed. There can be no doubt that the surgeon has been justified, however, in operating in these cases, not only because he was unable to say that the condition was non-malignant, but also because by treating them as if they had been malignant, he was acting in the best interests of his patient. In view of the impossibility of being sure of the true nature of the tumour-like formations, it is probable that as time goes on the number of cases in which an operation is performed as if for malignant new growth will increase rather than diminish. This sounds very much as if one were recommending a needless use of the knife, but where the only hope lies in a timely operation it is surely better to be too early than too late, especially as when the tissues of those doubtful cases are submitted to the skilled histologist he also is not prepared to express a definite opinion, either for or against the tissue being that of malignant new growth.

It is the surgeon's duty to operate at the earliest moment, and, therefore, he need not regret having operated for what ultimately proves not to have been a malignant growth. The surgeon's duty to his patient requires him to take this risk, and it is the duty of those who have the opportunity to educate the public and the profession to recognise the urgency of early operation, even if the result prove that such operation was at the time somewhat premature. In the later stages of malignant disease, when it is so far advanced that its complete removal is quite out of the question, I consider the surgeon is not justified in recommending removal in notoriously hopeless cases by

operation, though I regret to say they are frequently performed for reasons not difficult to understand by young and enterprising surgeons, who allow their operative zeal to outstrip the surgical needs of the case. I have seen patients subsequently who have submitted to incomplete operations of this kind far and away worse after the attempt than before. It was a question to me whether I was more surprised at the fortitude of the patient or the courage of the surgeon who undertook the responsibility of carrying out an operation which not only risked a valuable life, but gave the patient the false hope of recovery which he quickly perceived was only a delusion.

Again, the performing of such hopeless operations on the off-chance of giving temporary relief might by its failure be the means of preventing other early operations being performed in favourable cases, where there is a good and reasonable chance of being of service to the patient, instead of abandoning him to a painful and lingering death, the sad termination of many inoperable cases of cancer.

ON A CASE OF PANCREATIC PSEUDO-CYST.

By ALEXANDER J. M. BLAYNEY, M.A., M.B., B.Ch.;
Fellow of the Royal College of Surgeons;
Surgeon, Mater Misericordiæ Hospital.

[Read in the Section of Surgery, November 13, 1904.]

I must apologise to the members of the Surgical Section for the very imperfect manner in which this paper is laid before them. When I gave notice to the Secretary that I intended to make a communication on this subject I thought I should have at least a month in which to prepare it. It was only on Monday last I was told that it was the wish of the Council that I should present it at this meeting, inasmuch as Mr. Taylor's paper dealing with pancreatitis—a cognate subject—was to be brought forward this evening.

I shall first relate briefly the notes of the case, which seemed to me of sufficient interest to warrant me in laying it before you:—

I was called to the country to see a young man, aged nineteen, who had, about eighteen days previously, met with an accident when cycling. He ran into a horse and trap which were coming in the opposite direction and received a blow in the epigastric region, being struck, it is said, by the horse's collar. He was not going very rapidly at the time, probably about six or seven miles an hour, and the trap was travelling at a slightly less speed. He was rendered unconscious for a few minutes, and on recovering consciousness he vomited. He seems to have suffered rather profoundly from shock, and was conveyed home, a distance of about a couple of miles, in a collapsed condition. It is stated by his people that, when being put to bed, a tumour in the epigastric region was already visible. He was now seen by two medical men, one of whom suggested operation, while the other,

whose opinion prevailed, declared himself against it. The treatment for shock was administered, and the patient rallied; the bowels moved; food was retained without discomfort, and progress seemed on the whole to be favourable. About the end of a week some pain was complained of about the splenic region, for which the medical attendant, regarding it as indicating congestion of the spleen, applied three leeches. Relief was obtained, but all the time the tumour of the epigastric region persisted and steadily increased, and there was a corresponding steady emaciation of the patient in progress. About seventeen days after the accident pain was again complained of, vomiting came on, and some general distention of the abdomen made its appearance. The vomiting was repeated on the next day on two occasions. I saw him for the first time on that night somewhat after eleven o'clock. He was by this time considerably emaciated, with a very much swollen abdomen, the epigastric region being particularly prominent. The heart impulse was raised so that it was to be felt in the fourth interspace in the nipple line. There was considerable general tenderness over the abdomen, more especially over its left portion. The epigastric prominence was dull on percussion, the dulness being continued out towards the splenic region. Above could be made out gastric resonance, whilst the whole area below was tympanitic. The temperature was slightly elevated, reaching to nearly 100° F., and the pulse-rate was 106. The diagnosis which I made at the time, bearing in mind the rapid appearance of tumour, the suggestion of splenic tenderness, and the onset of peritoneal symptoms at a comparatively late period, was that some rupture of the spleen had occurred leading to considerable hæmorrhage, and that in the hæmatoma so formed, the entrance of bacteria from the intestinal walls was leading to peritonitis. After a considerable amount of deliberation I decided to await morning before undertaking the operation. With the conception of the case which I have just mentioned in my mind I made an incision about five inches long through the outer part of the left rectus, reaching to about an inch from the ribs. On opening into the abdomen the first thing especially noticeable was a marked bulging forwards between the stomach and the transverse colon. Below, the small intestines were considerably distended and somewhat injected. I now passed my hand under the ribs and brought

forward the spleen, which was perfectly normal in appearance. I again inspected the injected jejunum and found flakes of lymph between the coils, one mass of lymph measuring about three inches in length. I removed these, and washed this region with saline solution. It was, of course, obvious that my diagnosis of the splenic origin of the trouble was wrong, and I now came to the conclusion that the origin was to be sought probably in an injury to the pancreas. I returned to the swelling between the stomach and colon, brought the most prominent part into the wound, packed around with gauze, and incised it. Immediately there was a gush of a clear yellowish fluid, which continued to pour out through the aperture till at least about two quarts had come away. Towards the end there were traces of dark-coloured hæmorrhagic material, followed by some fresh blood. As the fluid flowed out I brought forward the edges of the aperture I had made, and stitched them to the margins of the wound. When the fluid had ceased flowing I examined the cavity with my finger, and could easily feel a soft mass, which I took to be the pancreas, at the back. Above I could feel the liver, and the deepest part of the cavity was above and to the left, in which direction I could not touch the posterior wall of the sac. A tampon of gauze was now introduced into the cavity and the external wound closed. The operation had been very well borne, and the patient was returned to bed in good condition, and with now a nearly flat abdomen.

Reviewing the case when the operation was concluded, it still seemed to me that the pancreatic origin of the fluid was the most probable one. The presence of inflammation of the greater sac of peritoneum I then attributed to beginning leakage from the cyst, probably through a thinned transverse meso-colon. This explanation still appears to me the most probable one.

The subsequent progress of the case is of considerable interest:—

I saw the patient next on the evening of the day following the operation, when I removed the gauze tampon and inserted another smaller one. There had been but little discharge from

the wound, and the boy's condition was very good. Next day I heard from the doctor in charge that there had been a great oozing of clear fluid alongside of the gauze, and he asked me to come to see the patient again. On visiting him I found the dressings soaked, although they had been on only about two hours, and the skin around the margin of the wound becoming a little reddened. I inserted a drainage tube into the aperture, and gave directions to have the dressings changed as soon as they became moist. I also asked to have some of the fluid kept and sent up to me, but my directions in this respect were not carried out. The progress of the case subsequently, as I learned from the doctor in charge, was as follows:—At first the dressings required very frequent changing, especially after he had partaken of food. The skin became excoriated all round the wound wherever it came in contact with the discharge. About a fortnight after the operation considerable pain was complained of internally, which disappeared on shortening the drainage tube. At the end of four weeks the discharge, which had been gradually lessening, was very small in quantity, and the drainage tube was removed. In another ten days it had ceased altogether, and the wound closed up completely. The skin around at once began to recover its normal appearance, and from this on the patient remained perfectly well. He began to increase in weight soon after the operation, and is now as strong as before the accident.

The points on which I wish to lay emphasis are the rapid appearance of an epigastric swelling, its subsequent gradual increase, the steady emaciation, the relation of the swelling to the stomach resonance, the elevation of the heart, the character of the fluid, which presented but slight traces of old blood effusion, the irritating qualities of the subsequent discharge and its increase some time after taking food, and lastly, the evidence of beginning peritonitis.

In describing the case as one of pancreatic pseudo-cyst I have adopted the term first suggested by Jordan-Lloyd, and made use of by Mayo Robson in his work on diseases

of the pancreas. When attention was first called to cystic swellings in the neighbourhood of the pancreas it was usual to describe them all as pancreatic cysts, and it was thought that they had their origin in the substance of the pancreas. Jordan-Lloyd, from the study of two cases which came under his notice, was the first to suggest that most, if not all, which follow soon after an injury do not arise inside the pancreas. His views are as follow:— The pancreas is a soft, easily lacerable organ, running across the first lumbar vertebra, and projecting into the lesser sac of peritoneum, receiving a covering from this which is closely adherent to its anterior surface, from which it is never separated, by a layer of fatty tissue even in the most corpulent. Violence applied to the epigastric region, if it overcome the resistance of the abdominal muscles, may press the pancreas against the vertebræ and tear its friable substance and with it the peritoneum, which is closely adherent to its anterior surface. Blood and pancreatic fluid escape into the lesser peritoneal cavity. I may here remark that in the records of *post-mortem* examinations quoted by Mayo Robson on cases dying after injury to the pancreas, the hæmorrhage was slight when the pancreas alone was injured. The effusion of these fluids excites an inflammation in the lesser sac, which seals the foramen of Winslow, and leads to an outpouring of serum. The mixture of serum, blood and pancreatic fluid still continues to irritate, and very soon the cavity becomes completely distended. The walls then resist further distention, so that the subsequent increase in size is slow. When the cyst is opened and drained pancreatic fluid will still continue to flow from the rent in the gland, and will accordingly make its way through the drainage aperture. The chief points on which he relies are the mode of increase of the swelling—at first rapid, subsequently slow—suggest-

ing the outpouring of fluid into a pre-existing space, and the shape of the cavity, which corresponds with that of the lesser sac of peritoneum, being deepest above and towards the left in the direction of the spleen. These two conditions were present in my case; and I might add a third — that the membrane stretching from the stomach to the colon which I incised was scarcely, if at all, thicker than the normal gastro-colic omentum, suggesting the absence of a cyst-wall as a distinct structure. On the whole, the explanation given above seems to me a reasonable one, and one which best accords with the facts of my own case.

I regret that I am unable to lay before you the results of an examination of the discharge. Without this I am aware that the history of the case is very incomplete. I asked on more than one occasion to have the fluid sent to me, but failed to get it. I have no doubt that I should have found some, if not all, of the pancreatic ferments in it, but, as it is, the only evidence that it was pancreatic juice is the markedly irritating qualities it possessed, as shown by the widespread excoriation of the skin.

SOME OBSERVATIONS ON PYLORIC STRICTURE.

By SIR THOMAS MYLES, F.R.C.S.;
Surgeon to the Richmond Hospital.

[Read in the Section of Surgery, November 13, 1904.]

I WISH to bring before the Surgical Section to-night some of my recent experiences in connection with the surgery of the stomach, and I shall endeavour to be as brief as the circumstances will allow me. The first case is one of the removal of the pylorus and nearly half of the stomach for malignant disease:—

The patient was a young woman, aged thirty-two, with the following history:—Some months before admission she had two attacks of jaundice with acute pain and vomiting, followed by progressive emaciation and debility. On admission she complained of pain in the right hypochondriac and epigastric regions, occasional vomiting, and great weakness. On examination a swelling the size of an orange could be felt behind the right rectus, about two inches below the right costal cartilages; it was movable from side to side, apparently swinging on a pedicle; not movable from above downwards, globular, fairly smooth and not tender to the touch. The stomach was not markedly dilated. She was extremely thin and fragile looking, weighing only 90 lbs.

Taking the history of attacks of acute jaundice into account, with pain and vomiting, I came, perhaps too hastily, to the conclusion that she was suffering from gall-bladder trouble, and decided to explore that region. Under anæsthesia, however, it was noticed that the tumour was nearer the middle line than it had appeared before, and that it was also movable from above downwards to an extent that precluded the possibility of its being a distended gall-bladder. I therefore made an incision in the middle line, and not through the right rectus, as I had intended. The incision promptly showed me that I had to deal with a pyloric tumour of some size. Careful examination showed that the tumour encroached upon a large area of the stomach,

that it had puckered up the great omentum in such a way as to bring the right end of the transverse colon in close apposition to it. It could, however, be moved freely in every direction, and, after the incision had been enlarged, was easily delivered through the wound. I confess that for a moment I shrank from the task of removing it; but, taking the wretched condition of the patient into consideration, the fact that if unrelieved she had but a short time to live, and the unusual mobility of the growth, I resolved to give her the chance, desperate though it seemed, of a complete removal, rather than the temporary relief of a gastro-enterostomy.

I should add here that my only assistant throughout the operation was my resident pupil, Mr. Parker, to whose skill and intelligence I am greatly indebted.

The removal of the growth was carried out on the following lines:—The duodenum at the junction of the first and second stages was clamped in two places, and divided between. To prevent leakage a short ligature was passed under the forceps and around the stomach end of the divided duodenum and tied as lightly as possible. The other end was encircled by a finer purse-string suture, the cut edges invaginated, and the ligature tightened as in an appendicectomy, thus converting the end of the duodenum into a *cul-de-sac*. The vessels along the upper curvature of the stomach were dissected out and secured, great care being taken to avoid injury to the gastric artery. The pyloric branch of the hepatic artery was tied down close to the tumour, and with the greatest caution the growth was raised from the neighbourhood of the bile-duct and portal vein. The next step was the separation of the transverse colon and omentum from the stomach. The latter was completely detached from the stomach and removed *en bloc*. Some glands close to the lower border of the stomach were removed with it. The complete removal of the great omentum gave great freedom to the subsequent manipulations. As I now proposed to divide the stomach at the point where its vertical diameter was greatest, and as I had no forceps sufficiently long to clamp it completely, I fixed one long forceps above and another below, and entrusting them to my assistant, I instructed him to keep them as much on the stretch as was consistent with safety, while I divided the stomach with the scissors on the distal side of the forceps from below upwards.

The other end of the stomach was simply encircled with a stout ligature to prevent any soiling of the peritoneum by leakage of stomach contents.

The stomach having been divided, the tumour area was wrapped in a sterilised towel and left for a few minutes. The wound in the stomach was now rapidly closed by a continuous suture passing through all the coats, the loops of the suture enveloping the large forceps used as clamps. As the suture was drawn taut these were withdrawn. In this way, without any leakage, the large wound in the stomach was temporarily closed, and this stage was completed by a row of Lembert sutures passing through serous and muscular coats, tucking in and completely covering the first row of sutures. The portion of the stomach now remaining was thus, like the duodenal end of intestine, made into a *cul-de-sac*.

The third stage of the operation consisted in dissecting the growth off the pancreas, bile-duct, portal and splenic veins. Separation from the vessels was easy, but the attachment to the pancreas was intimate, and separation from it resulted in leaving a raw surface of pancreatic tissue, which caused me some anxiety. One or two deep vessels coming from the sub-mesenteric, close to its origin, required ligature.

The last stage of the operation was the attachment of the posterior aspect of the stomach to the jejunum by a Murphy's button. In carrying out this posterior gastro-enterostomy, I departed from the usual procedure of penetrating the transverse meso-colon, and instead carried the small intestine in front of the colon. This was rendered easy by the previous complete removal of the great omentum, and saved some little time and trouble. The parietal wound was closed by a single row of silkworm gut sutures, and the operation was complete, having lasted altogether two hours and ten minutes.

The patient was in a state of profound collapse after this long exposure and extensive resection, and vigorous measures were adopted for her resuscitation. Oxygen inhalation, hypodermic injection of strychnin, rectal injection of alcohol, and subcutaneous saline infusion were all employed. Notwithstanding all these, though faintly conscious, her pulse at 9 p.m. could not be felt. She was still deadly cold, and covered with a clammy sweat. To put it plainly, her condition seemed hopeless.

Strychnin was again injected in large quantities—$\frac{1}{10}$ grain

every hour for three hours; hot flannels were applied over her heart; subcutaneous transfusion was again resorted to, and her legs and arms were enveloped in cotton wool and flannel bandages. For thirty-six hours she lay in this moribund condition, and then gradually her own vitality won the day, and she began to gather strength. Her subsequent progress was uneventful, save for the occurrence of a small fistulous opening which made its appearance on the fourteenth day and closed after a few days with ordinary treatment.

The operation of pylorectomy, formerly regarded as a hopeless procedure, is now of fairly frequent occurrence. I need only recall to the notice of the Section the brilliantly-successful case recorded by our friend Mr. Gordon at the close of last session as proof of this assertion.

Had this been an ordinary case, therefore, of pylorectomy, I would not have brought it under your notice, but I think there are facts in the case that justify me in considering it as a little outside the usual run of such cases.

First was the eternal question of diagnosis. This case I originally believed to be one of distended gall-bladder, and it was not till the patient was under an anæsthetic and her muscles completely relaxed that I began to suspect the real nature of the swelling. Secondly, the extraordinary mobility of such a large growth is, in my opinion, quite unusual.

In the majority of cases of carcinoma of the stomach, long before the growth has attained a considerable size, extensive adhesions have formed in the neighbouring organs, and complete removal is out of the question. I do not think, therefore, that one is justified in deducing from the result in this particular case that removal of large growths in the pyloric area is likely to be a successful operation. Our hope of success must rest in an early diagnosis and operation.

The last feature of the case to which I would wish to

draw your attention was the method I adopted, differing, as it does, so completely from the method usually recommended and practised.

Till quite recently the mortality in pylorectomy was nearly 100 per cent., and this at the time when resection of portion of the colon, or small intestine, for malignant disease or local gangrene was carried out with a fair measure of success. Now, why should there be this great difference in the mortality of these two not very dissimilar operations? The answer is found, I believe, in the difficulty of making a perfectly tight joint between the stomach and duodenum by the ordinary end-to-end anastomosis, and this difficulty is due to several factors:—

First.—Owing to the great size of the opening in the stomach, as compared with that of the duodenum, it becomes necessary to first close the stomach opening in part, so as to approximate its calibre to that of the duodenum. When the duodenum is now attached to the stomach, part of the line of attachment must be along that area of the stomach which is carrying a double row of ligatures, and which has quite as much as it can do to repair its own wounded area without being called upon to supply the repairing material necessary for the junction with the duodenum. Apart altogether from the mechanical difficulty of making a close joint here, there is, I think, an excessive demand made upon the reparative forces of the peritoneum by this method.

Secondly.—When the pyloric tumour has been removed the pyloric branch of the hepatic artery must be divided. This artery is largely responsible for the nutrition of the first portion of the duodenum; therefore, when it is divided the duodenal end of the line of junction can do but little in supplying nutritive material to the uniting area.

Thirdly.—In endeavouring to approximate the stump of

the stomach to the duodenum considerable traction must be exercised, and the subsequent tension and tendency of the segments to separate is not likely to be favourable to a successful result.

Contrast this with the method I have outlined in my case. There is no difficulty whatever in completely and rapidly closing both viscera. The duodenum drops back without any tension whatever, and even should its own reparative powers be inadequate, the peritoneum of neighbouring organs pressing upon its end promptly supplies any deficiency. Similarly, the stomach opening can be rapidly closed without any tension, and without any undue demand on its reparative powers, and,

Lastly.—Prompt and absolutely secure anastomotic union can be established by means of a Murphy's button.

In this connection I should like to refer to the admirable discussion by Mr. Makin of the relative merits of end-to-end as compared with side-to-side anastomosis. This case was operated upon before I had read Mr. Makin's paper, but it is interesting to me to notice that I had, independently, as the result of my own experience, arrived at almost the same conclusions as this distinguished operator.

In my opinion, in the majority of intestinal resections side-to-side anastomosis is established more quickly, easily and safely than end-to-end anastomosis, and is, therefore, to be preferred. I feel convinced now that in an ordinary case of pyloric tumour of moderate size, with an appropriate equipment, the operation I have sketched out could be completed inside thirty minutes, and that its performance should be but little more hazardous than gastro-enterostomy.

Now, before concluding, if I am not too tedious, I should like to lay before the Section the result of my experience in gastro-enterostomy. Altogether I have performed up

to 51 operations of election on the stomach. Four of these were pyloroplasties for benign stricture of the pylorus, and one died—the first of the series. Forty-seven were gastro-enterostomies, without a single death.

I mention these results, not in a spirit of boasting, but in one of profound thankfulness. My assistants in these operations have been very varied indeed in their attainments and experience. I have the honour of being assisted by the great skill and experience of my friends Professor Conway Dwyer, Dr. Lentaigne, Dr. Lane Joynt, and my incomparable colleague, Mr. Robert Harvey; by my friends in the country, such as Dr. Rice, of Portarlington; Dr. Coady, of Naas, and Dr. Sullivan, of Navan. Sometimes my assistants were limited to my own unqualified pupils resident at the hospital, such as Dr. O'Donnell Browne, Dr. Lilly Baker, Dr. Hanlon, and Miss Adderley, and in the serious operation I have detailed above my sole assistant throughout was my present resident pupil, Mr. Parker, who recently obtained, oddly enough, the Silver Medal in Medicine at the College examination. I mention these facts not, on the one hand, either to unduly enhance the value of the assistance I received from my experienced friends, nor to detract in any way from the help afforded by any of my younger, but often more obedient, colleagues, but rather to show that the operation is one of the safest, simplest, and most beneficial in the whole domain of abdominal surgery. The operation has been undertaken by me for the most varied conditions—for extensive carcinoma, for fibrous stricture of the pylorus, and lately for simple atonic dilatation causing anæmia and emaciation.

No one questions its value in pyloric carcinoma. Many surgeons consider that in fibrous stricture pyloroplasty is to be preferred, as being a nearer approximation to the normal condition, and a more logical procedure. Without

in any way disparaging the great suggestion of Mickulicz, or the value of logical deductions in general, I venture to assert that logical deductions must give way to the evidence of accumulated facts. Logic, as Falstaff says of honour, "has but small place in surgery," and no one who has an extensive experience of the two operations will long hesitate in deciding which of the two is safer for his patient, and which is likely to be productive of the best results.

I do not intend now to enter into a discussion of the relative merits of the button compared with the simple suture. I have tried both methods and been equally successful with both, but of late I have inclined more to the button, and the last fourteen cases have all been done with it. I should add, however, that I never limit myself to the button, but always use a certain number of sutures outside it—not to make the junction more secure, but to get as great a length as possible of jejunum in apposition with the stomach, and thus prevent the sharp knuckling at the point of union, which I believe to be responsible for the reflux of bile into the stomach which has in certain cases diminished or even destroyed the value of the operation.

I have never found it necessary to make either a second anastomosis between the segments of small bowel on each side of the button, or to carry out the much graver procedure of completely dividing the jejunum and then attaching the upper end of the main segment to the stomach, while the upper end of the smaller segment is implanted into the jejunum some four or five feet lower down.

The button has three great advantages over rival methods:—1st absolute security against leakage; 2nd, rapidity of application; 3rd, and most important, the patient can commence taking food as soon as the ether nausea has passed off. For these reasons I regard the

button as an essential item in abdominal surgery equipment.

In all my cases I have used the posterior route, and do not consider it necessary to advance any arguments in support of such an obviously correct course.

Only one point remains for discussion, and that will not take many minutes. It has been customary hitherto to traverse the transverse mesocolon in joining the jejunum to the back of the stomach. Is this necessary or advisable? It is open to the grave objection that it limits the area of attachment to the size of the area embraced in the loop of the colica media artery. Sometimes this area is not more than an inch and a half in length, rarely is it more than two inches. Now this is not sufficient to get a good flat surface of union free from danger of kinking, and if kinking occurs regurgitation of bile must follow.

On the other hand, if the great omentum be removed and the transverse colon depressed, the whole length of the posterior wall of the stomach is available, and we can unite a length of six or seven inches of apposed viscera. This did not occur to me until the other day, but I intend to give it a trial in future cases, and put it forward as a suggestion for my friends to at least consider.

THE SURGICAL TREATMENT OF ABDOMINAL ANEURYSM.

By R. CHARLES B. MAUNSELL, M.B. (Univ. Dub.), F.R.C.S.;
Surgeon to Mercer's Hospital;
Member of Council, R.C.S.

[Read in the Section of Surgery, December 11, 1903.]

In discussing the subject of abdominal aneurysm I will not refer specially to aneurysm of the iliac arteries, as I think that ligature or possibly Matas' operation, referred to later on, would be the only methods of operative treatment considered at the present day. With regard to aneurysm of the other smaller abdominal vessels, ligature or excision appear to be indicated if a surgeon should meet with one of these rarities. Henry Morris states (*Lancet*, Oct. 6th, 1900) that there are only twenty-one cases of aneurysm of the renal arteries on record. Caton (*Clin. Soc.*, London, 1886) could only find eleven cases of aneurysm of the hepatic artery; whilst aneurysm of the splenic and mesenteric arteries are merely pathological curiosities.

Aneurysms of the abdominal aorta are not common, as they form but 5 to 10 per cent. of all aortic aneurysms; men are about seven times more subject to them than women; they occur most frequently between the ages of 25 and 50, chiefly, if not altogether, in those who have suffered from syphilis some years previously.

With regard to the syphilitic origin of non-traumatic aneurysms in general, Etienne (*Ann. de Derm. et de Syph.*, Jan., 1897) states that in 376 cases collected by him 70 per cent. had syphilis. Heller (*Munch. med. Wochen.*,

Dec. 12, 1899) strongly upholds the view that the disease begins as a syphilitic process in the tunica media.

Within the last few years I have seen six cases of abdominal aneurysm—five men and one woman. The ages varied from twenty-four to thirty-seven years. Four of the men stated positively that they had suffered from syphilis. One man—the case related in this paper—had a chancre and bubo eight years previously. The woman had a history of miscarriages and dead-born children, which pointed strongly to syphilitic infection; also the autopsy showed extensive arterial disease (Maunsell, *Trans. Roy. Acad. Med., Irel.*, Vol. XVII., 1899, p. 460).

It is generally estimated that at least 50 per cent. of abdominal aneurysms arise from the aorta above the superior mesenteric artery, the origin of the cœliac axis being the part usually most involved. About half these tend to grow at the expense of the anterior wall of the aorta, the remainder growing backwards, eroding the vertebræ or ribs.

The aneurysm may be fusiform, sacculated, or dissecting, or may present a combination of these primary forms.

It is important to remember that general arterial disease frequently co-exists, and that in many cases intra-thoracic aneurysm may be present.

It is beyond the scope of this communication to enter into a discussion on symptoms and diagnosis, but I would point out the frequency of stomach symptoms, emaciation, obstinate constipation, and pains referred to the shoulder or back, which often lead to an erroneous diagnosis, and to the fact, pointed out by Foot (*Trans. Roy. Acad. Med., Irel.*, Vol. V., 1887), that in women the symptoms may be few and the disease entirely overlooked.

Spontaneous cures are not unknown, and from time to time consolidated aneurysms are found in persons dying from some other complaint, but the ordinary termination of

the disease is death from internal or external hæmorrhage within a period varying from a few months to three years subsequent to coming under observation.

The treatment of Bellingham (*Dub. Med. Press*, Vol. XXVII., p. 81) and Tuffnell ("The Successful Treatment of Internal Aneurysm by Consolidation of the Contents of the Sac," London, 1875) by absolute rest and starvation, &c., is now rarely used in its original form, as patients resent it; cure by it is extremely doubtful, and its scientific accuracy is impugned by many. It is, however, frequently used in a modified form in connection with any of the more modern methods. The administration of large and increasing doses of potassium iodide appears to be both scientifically correct and to have done good in many cases. Calcium chloride is undoubtedly establishing itself in the favour of surgeons, but the gelatine treatment of Lanceraux and Paulesco (*Bull. de l'Acad. de Med. de Paris*, 1887) is hardly yet worth serious consideration, although further use may lead us to acquiesce in its great French reputation.

Of the more distinctly surgical procedures we need merely mention the "Needling" of Macewen or the galvano-puncture of Velpeau, as they are both uncertain; but, if ever had recourse to, the only safe method of using them would be after laparotomy and exclusion of the aneurysm.

In 1864 Charles H. Moore, of the Middlesex Hospital (*Med. Chir. Trans.*, London, Vol. XLVII., p. 129), passed a fine trocar and canula into a large aneurysm of the ascending aorta, which was protruding in the second and third intercostal spaces, and introduced 26 yards of fine iron wire through the canula, pushing the end home by means of a blunt trocar. The patient seemed much relieved, but died on the fifth day from acute sepsis. *Post-*

mortem, the aneurysm was found full of solid clot, firmly engaged in the coils of wire.

Loreto, in 1885 (*Mem. Roy. Acad., Bologna*, Vol. 6, series IV.), was the first to apply this method to an abdominal aneurysm. He performed laparotomy, and, through the canula, passed six feet of fine silvered copper wire into the sac which was very large. The patient left hospital in ten weeks with the aneurysm reduced to a hard, non-pulsating mass the size of a walnut, but died three weeks later from rupture of the aorta below the aneurysm.

G. L. Hunner (*Bull. Johns Hopkins Hosp.*, Nov., 1900) has collected all the published cases of this operation, both thoracic and abdominal, up to 1900. There were fourteen operations, with three cures and eleven deaths. In nine of the eleven fatal cases a *post-mortem* was obtained, and all showed that the presence of the wire had induced firm clotting.

I append a list which I have compiled of eight cases of abdominal aneurysm treated by Moore's method, with three cures of the aneurysm:—

TABLE I.—*Moore's Method.*

Operator	Published	Sex; Age	Prev. Hist.	Site of Aneurysm	Operation	Result and Remarks
Loreta	1885. Mem. Roy. Acad., Bologna. Vol. 6, Series IV.	M. 30	Syphilis	Epigastrium	Laparotomy; 6 feet silvered copper wire passed through canula	Left hospital in ten weeks; aneurysm hard, and size of walnut; died three weeks later from rupture of the aorta below the aneurysm
Morse	1887. Pacific Med. Journal, Feb.	M. 32	Trauma	Abdominal	Laparotomy; 5½ feet silvered copper wire passed through hollow needle	Left hospital in eight weeks with small non-pulsating tumour; died four years later from hæmatemesis following a kick
Pringle and Morris	1887. Med. Chir. Trans. London. Vol. LXX., p. 261	M. 46	Syphilis	Cœliac region on post. wall, eroding the vertebræ	Laparotomy; 1 foot of steel wire passed through canula	Died on 5th day from "Asthenia"; sac full of *ante-mortem* clot
Lange	1886. Phila. Med. News. Vol. XLIX., p. 582	—	—	Cœliac region	24 feet of wire passed without laparotomy, as the aneurysm had burst	Died 12 days later from pneumonia; aneurysm full of clot
Stevenson	1895. Lancet. Vol. I., p. 22	M. 25	—	Mesenteric region	Laparotomy; 2 yards fine steel wire passed through canula	Died in 27 hours from hæmorrhage from the canula puncture; the sac full of clot
Langton	1899. Brit. Med. Jour. Vol. I., p. 791	F.	—	Upper abdominal aorta	Laparotomy; 5 feet silver wire passed through canula	Consolidated one month later; alive and well one year later
Parnham	1901. Am. Medicine. June 22. Article by R. Matas	M.	—	Abdominal aorta	Laparotomy; 26 feet of steel wire passed through canula	Died on 45th day; the wire had entered the left ventricle, and had also perforated the descending aorta
D'Arcy Power	1903. Lancet, Sept. 19, p. 808	M. 29	Syphilis	Upper abdominal aorta	Laparotomy; 80 inches No. 27 silver wire passed by a special instrument	Died 50 hours later; the wire had passed up the aorta to the arch

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The cases which did best were those in which from five to six feet of wire were used, and Moore himself considered that he had used too much wire in his thoracic case.

In 1879 Corradi (*Lo Sperimentale*, April, 1879, p. 445) modified Moore's method in a case of aneurysm of the ascending aorta, by passing seventeen inches of annealed wire through a canula, passing a current from a galvanic battery of 16 cells for twenty-five minutes, the anode being attached to the wire, which was subsequently pushed under the skin. The patient improved, but died thirteen weeks later. No *post-mortem* was obtained. G. L. Hunner (*loc. cit.*) has collected 23 cases of thoracic and abdominal aneurysms treated by this method, with four cures, nine considerably benefited and life prolonged, and 10 in which death was probably hastened.

I append a list which I have compiled of eight cases of abdominal aneurysm treated by this method which I think represents all cases published up to the present date :—

TABLE II.—*Moore-Corradi Method.*

Operator	Where Published	Sex; Age	Prev. Hist.	Site of Aneurysm	Operation	Result
Stewart	1898. Phila. Med. Jour., Nov. 12	M. 40	Syphilis	Fusiform dilatation of aorta in cœliac region	Laparotomy; 10 feet silver wire and 50 ma. by anode for ½ hour	Died on 5th day from hæmatemesis; no clot in aneurysm
Noble	1898. Phila. Med. Jour. Vol. I., p. 1203	M. 37	Syphilis	Midway between ensiform cartiliage and umbilicus	Laparotomy; 8½ feet hard drawn No. 30 gold wire through needle insulated by celluloid, and current slowly increased during 35 min. to 70 ma.	Left hospital in six weeks with small hard mass; died eight months later from acute dysentery; no *post-mortem*
Halsted	1900. Johns Hopkins Hospital Bulletin. Vol. XI., p. 271	M. 27	Syphilis ?	Fusiform in cœliac region, vertebræ adherent	Laparotomy; 17 inches No. 27 silver wire, then 38 inches No. 25 silver wire through a special needle, which was withdrawn. Current by anode 30 to 100 ma. for 1 hr. 25 min.	Died 40 hours later from rupture of aneurysm through diaphragm into pleural cavity
Finney	1900. Johns Hopkins Hospital Bulletin. Vol. XI., p. 273	M. 25	Syphilis ?	At root of sup. mesenteric artery	Laparotomy; 5 feet No. 28 wire, 75 part copper to 1,000 silver, passed through insulated needle, and 30 and 70 ma. by anode passed for 1 hr. 20 min.	Died 20 days later from hæmorrhage through the wound from the needle puncture; aneurysm full of solid clot and wire

TABLE II.—*Continued.*

Operator	Where Published	Sex; Age	Prev. Hist.	Site of Aneurysm	Operation	Result
Reeve -	1899. Annals of Surgery. Vol. XXX., p. 704	M. 49	—	Two inches above bifurcation of aorta	Laparotomy; 7 feet silvered copper wire through canula, and 80 ma. by anode for 50 min.	Died 24 hours later; the wire had passed up the aorta to the aortic valves
Finney -	1900. Johns Hopkins Hospital Bulletin. Vol. XI., p. 276	M. 30	—	Root of sup. mesenteric artery	Laparotomy; 8 feet of drawn silver wire through insulated needle, and 10 ma. by anode passed for one hour	Left hospital in six weeks feeling better, but pulsation still present; no further history
Matas -	1901. Am. Medicine, June 22	M. 23	—	Fusiform in cœliac region	At first Macewen's "Needling" after exclusion; later 10 ft. silver No. 28 wire through canula, and 75 ma. passed for 4 hours 20 min.	Patient died 19 days later from rupture posteriorly. *Post-mortem.*—Aneurysm full of clot
R. Charles B. Maunsell	Present Paper -	M. 28	Syphilis?	Cœliac axis -	Laparotomy; 18 feet No. 28 silver wire through insulated canula, and 65 ma. by anode for 35 minutes	Aneurysm very much reduced in size, and ceased to pulsate eccentrically; patient died 47 days later from rupture of aneurysm into the stomach; aneurysm almost full of firm clot in the meshes of the coils of wire

In this list we can only claim one cure, which compares badly with Moore's method, but the cases are too few for definite conclusions, and careful study of all cases, both thoracic and abdominal, besides experimental data and scientific reasoning, lead steadily to the opinion that Corradi's modification is the better operation. D. D. Stewart, who has written a most valuable article on this subject (*Phil. Med. Journ.*, Nov. 12, 1898), thinks highly of the method. He considers that the wire should be fine drawn, so that it will tend to coil spirally, and should be made of silver, gold, or platinum, not of steel or hard iron, as it may snap or perforate the sac; nor of soft iron, as it will be decomposed by the electric current, leading to embolism. In his opinion too much wire is used by most operators. In a sac of 3 in. diameter 3 to 5 feet of wire is sufficient, and for a very large sac 8 to 10 feet. He recommends that the anode should be connected to the wire, and the cathode connected to a clay plate applied to the patient's back or abdomen, a current of 40 to 80 ma. being passed for 45 minutes to 1½ hours.

Rudolph Matas (*Am. Med.*, June 22, 1901) is very despondent. He says that if thorough clotting were to take place in the cœliac region the blood-supply would be cut off from the abdominal viscera; that there is a danger of throwing extra strain on weak spots in the sac; the sac may be perforated by the wire or the wire may travel up the aorta to the heart; gangrene may follow clotting; rupture of the sac may follow diminished pressure when the abdomen is opened, &c.

He thinks that the operation should only be performed when the patient is young; when the sac is small and thick walled, arising below the superior mesenteric, or, if above this, when on the side or posterior aspect of the aorta.

G. L. Hunner (*loc. cit.*) is more enthusiastic and hopeful.

He advocates using 10 to 20 feet of fine drawn wire, 75 parts copper to 1,000 silver, passed through a canula insulated by French lacquer. He says that on no account should both poles be connected with the sac, nor should the cathode be connected with the wire, as gas would be evolved with the formation of soft clot, and not firm clot such as is formed round the anode. He says that clot is formed better on silver than on steel, as it presents less resistance, and also is more corroded by the current. Twenty to 100 ma. currents were used by him in experiments upon dogs, the clotting being as good with the smaller current, whilst the stronger current distinctly injured the aortic wall where the wire came in contact with it. Therefore he advocates comparatively weak currents. The reasons given by him in favour of the copper and silver alloy are—that it is finer and coils better than silver, it coils closer, and is more easily corroded than steel, thus affording a good clotting surface.

I will now briefly relate the history of my case, and describe the technique of the operation as carried out in it:—

W. B., male, aged twenty-eight, storeman, stated that eight years ago he was treated for a chancre and bubo, but he does not appear to have been treated for syphilis. About a year ago he began to suffer from cramp-like pain in the region of the stomach and shooting pains in his back; he sometimes found difficulty in swallowing, and pain and vomiting occurred after meals. During the past six months he had wasted considerably.

He was sent to hospital as a case of gastritis or gastric ulcer; but my colleague, Dr. Lumsden, under whom he was admitted, found upon examination that there was a distinct pulsating tumour in the left epigastric region. Upon closer examination this tumour appeared to be about the size of an orange, was firm, and pulsated in an expansile manner; it descended slightly upon inspiration, and then appeared to be connected with a larger mass which descended from beneath the left costal margin.

The apex beat of the heart was situated outside the nipple line in the fourth intercostal space, but there was a diffused pulsation all over the lower part of the left chest. The second sound of the heart was accentuated over the aortic area, and a rough systolic bruit could be heard over the tumour and lower left chest, but could not be heard behind. The patient was kept under medical treatment for a month, but as the tumour rapidly increased in size and pulsated more vigorously Dr. Lumsden requested me to take charge of the case, with a view to operative treatment, as the patient and his relatives were extremely anxious that something should be done, no matter how risky the procedure might be.

Operation.—On July 22nd, 1903, ether having been administered, the abdomen was opened by an incision extending from the ensiform cartilage almost to the umbilicus. The aneurysm was found to be very large, filling the whole left cupola of the diaphragm, pushing the liver over to the right; the stomach was stretched like a strap across its lower and left aspect; the gastro-hepatic omentum was incorporated with its anterior wall. No aorta could be felt above the tumour, which appeared to insinuate itself between the crura of the diaphragm, but below the transverse mesocolon the aorta could be easily made out. The small tumour, felt clinically, was the overhanging lower margin of the large aneurysm, which at this point appeared very thin-walled and progressive.

A purse-string suture of No. 4 plaited silk was now passed, enclosing an area the size of a shilling on the anterior aspect of the tumour, and the ends were clipped in a forceps. The peritoneal cavity was packed off with gauze pads, and a fine trocar and canula plunged through the sac in the area surrounded by the suture, the point of the trocar being directed towards the left and upwards. The canula had been previously insulated by coating it with ordinary sealing wax. There are some practical points which might be here mentioned. The trocar and canula should be sterilised by boiling, then the operator, or his assistant, having sterilised his hands, holds the canula in the flame of a spirit lamp until it is fairly hot; next he places a few drops of previously melted sealing-wax on the canula, and by alternately rotating and passing it through the flame forms a thin, even coat of sterile wax, which is now hardened by placing the canula i

cold sterilised water until needed at the operation. The canula should not be placed in carbolic lotion, as this softens the wax and renders it useless. Having withdrawn the trocar only a drop or so of dark blood came through the canula, and now a piece of No. 28 silver wire, previously sterilised by boiling, was passed into the aneurysm, always keeping the canula pointed to the left, so that the wire might not enter the aorta. The wire passed freely through the canula, and when six yards had been introduced the remaining portion of the wire was removed from the reel, passed through a sterilised rubber tube and attached to the anode of a galvanic battery; the circuit was completed by attaching the cathode to an electrode which rested on gauze pads, soaked in salt solution, which were placed on the patient's sternum. During the first five minutes the current was increased from 1 to 65 ma., at which strength it was maintained for 30 minutes and then again brought to 0. The battery should be fitted with a collector, which prevents the shock of make and break whilst increasing or diminishing the current. The wire was now cut short, the end pushed home, and the canula withdrawn. Fairly smart hæmorrhage came from the canula puncture, but was easily stopped by tightening the purse-string suture. The abdomen was closed in layers by sutures of silk and silkworm gut. During the passage of the current the tumour became firmer, smaller, and pulsated much less distinctly. After the operation the patient's pulse was 112 and respiration 24, but in a few days both resumed a perfectly normal rate. The temperature throughout remained normal, except on the eleventh day after operation, when it reached 101° for a few hours owing to a superficial infection of the scar, which had been healed and without dressing for some days.

The after-treatment consisted of fluid in small quantities for the first ten days, then a small amount of bread and milk puddings until the thirtieth day, when he was allowed chicken, &c. For the first few days rectal injections of gelatine solution were given, but they irritated the bowel and were stopped. After the first week he was given 30 gr. of calcium chloride three times daily, but this seemed to cause dryness and itching of the skin, with branny desquamation, and was stopped in a fortnight.

The patient periodically suffered from pain in the abdomen and back for which morphia was given, but he expressed himself

as feeling better than he had been for the past year, and he certainly looked well and enjoyed life very fairly. For a fortnight after the operation the aneurysm appeared bigger than before, and the heaving of the left side of the chest was very marked, but from that period onwards it grew smaller and smaller, the pulsation ceased in the chest, the heart resumed almost a normal position, and the impulse felt in the epigastrium was no longer expansile in character.

About forty days after the operation he complained of pain in the point of his left shoulder, which became constant and severe, needing repeated injections of morphia for its relief. On the forty-fifth day he vomited several times; on the forty-sixth day he vomited blood and became weak; on the forty-seventh day he became progressively weaker and died.

Leave was, with difficulty, obtained to reopen the abdominal wound and examine the aneurysm. The stomach and intestines were found full of blood. The aneurysm, stomach, and adjoining parts were removed for dissection.

The three accompanying drawings and the specimens show clearly the conditions found. Fig. 1 is a back view of the aorta, aneurysm and stomach. The aneurysm is pear-shaped, about 4 inches long and $3\frac{1}{2}$ wide. It springs from the anterior wall of the aorta at the origin of the cœliac axis, and communicates with the aorta by an opening $1\frac{1}{2}$ inches long and $\frac{3}{4}$ inch wide. Immediately below the aneurysmal opening are the openings of the two renal arteries and superior mesenteric artery, which are indeed actually springing from the base of the aneurysm. The aorta below the aneurysm is small, compared to that above, but the portion removed appears free from disease.

Fig. 2 shows the antero-lateral aspect of the aneurysm cut open, and demonstrates the immense thickness of firm, laminated clot which had formed, almost filling the sac, and the small central cavity filled with a few coils of wire and more recent, but yet *ante-mortem*, clot. The six yards of wire are well covered in the organised clot, as only

one or two loops are visible in the centre of the section, thus proving that the clot formation was subsequent to the operation.

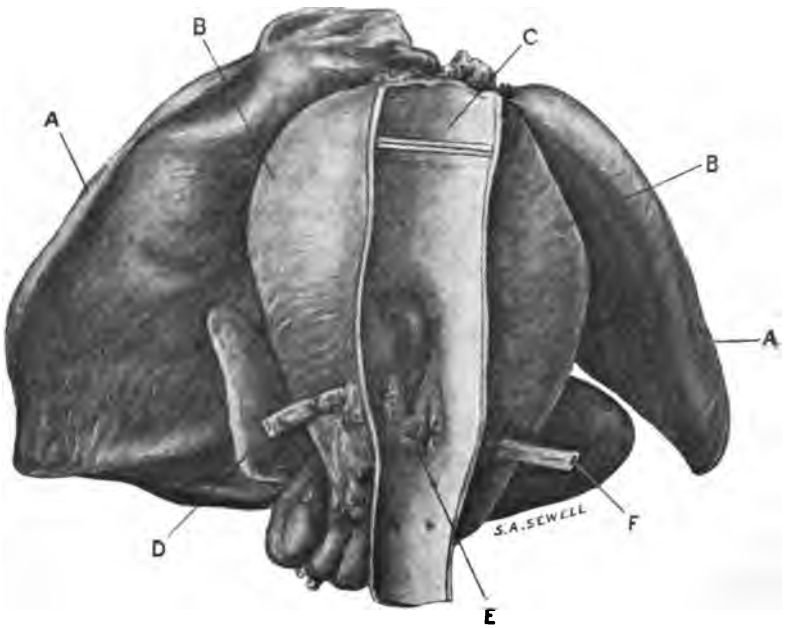


Fig. 1.

A=Stomach.
B=Aneurysm.
C=Aorta.
D=Pancreas.
E=Superior mesenteric artery.
F=Right renal artery.

Fig. 3 shows a left lateral view, the stomach being laid open from cardia to pylorus. It shows that the aneurysm had opened up the gastro-hepatic omentum, and that the lesser curvature of the stomach actually forms part of the sac. The cardia is acutely bent over the upper end of the aneurysm, and about $1\frac{1}{2}$ inches from it. In the centre of the adherent lesser curvature is a round ulcer, about the

size of a shilling, through the base of which shreds of organised clot protrude. On introducing a finger deeply into it coils of wire can be felt firmly embedded in the clot which fills the sac. The appearance, seen when the specimen was fresh, and indeed even yet, suggested that the fatal issue was due to ulceration spreading from the stretched portion of stomach, and not from progression of the aneurysm, which, but for the unfortunate position of the stomach in relation to it, was evidently fairly on the road to permanent cure by consolidation and organisation of its contents.

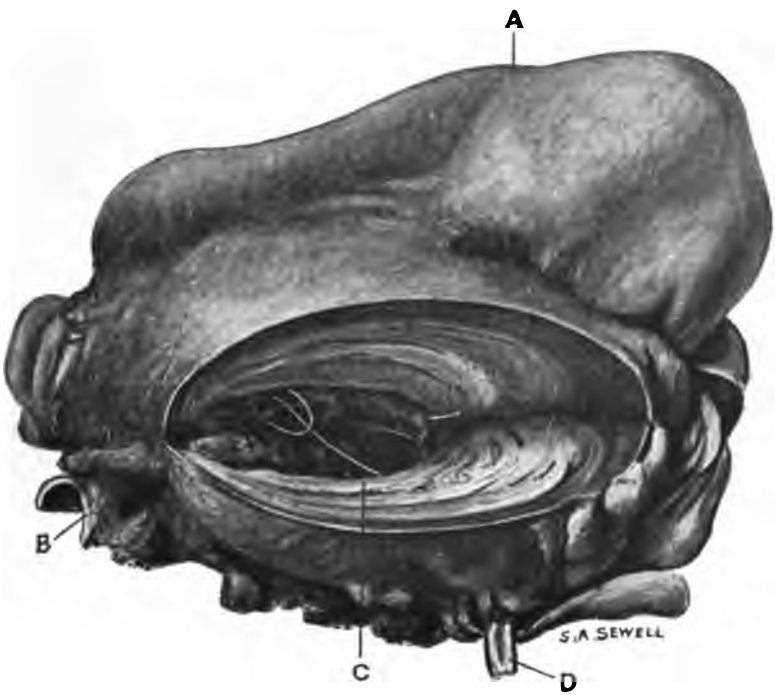


Fig. 2.

A = Stomach.
B = Aorta
C = Laminated clot and wire.
D = Right renal artery.

I will not discuss the subject of the Moore-Corradi method further, but will leave this case to speak for itself, as most certainly the conditions here found plead better than I could for a further trial of this ingenious operation. In this case the branches of the cœliac axis could not be traced, and, although certainly obliterated, no serious symptoms followed, as collateral circulation had already been established.

From time to time some daring surgeons have ligatured

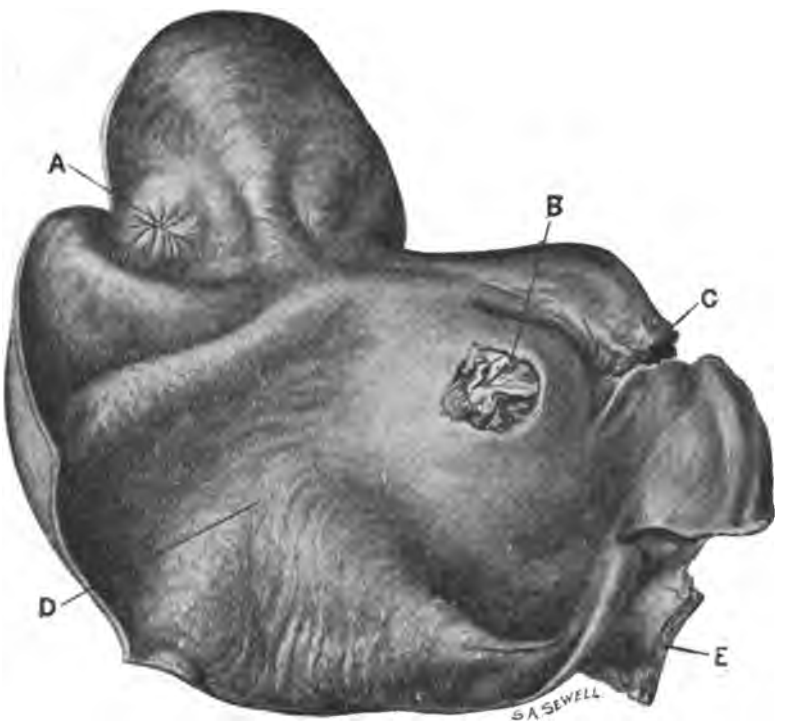


Fig. 3.

A = Pylorus.
B = Ulcer.
C = Cardiac orifice.
D = Gastric mucous membrane.
E = Aorta.

the abdominal aorta, and I find thirteen cases of permanent proximal ligature of the aorta have been recorded. Nine of these were for iliac aneurysm, two for hæmorrhage from the iliac artery, and two for aortic aneurysm. All these cases ended fatally, in from a few hours to forty-eight days, from shock, secondary hæmorrhage, or gangrene and sepsis. The two cases in which the operation was performed for aortic aneurysm deserve consideration, as the operators have made most useful suggestions. Milton, of Cairo (*Lancet*, London, 1891, Vol. 1, p. 85), ligatured immediately below the renal arteries, in a case of ruptured aneurysm of the mesenteric region, with a fatal result on the following day from anæmia and shock. Milton suggests that temporary proximal compression might be applied to the aorta by means of an elastic band passed through the lumbar muscles, across the aorta, the ends of the band, protruding behind, being drawn on at will, or the band removed.

W. W. Kean (*Am. Journ. Med. Sciences*, Sept., 1900) ligatured above the renal arteries for a ruptured aneurysm of the mesenteric region, with a fatal result on the forty-eighth day from secondary hæmorrhage. He has since made experiments upon dogs, and suggests that temporary proximal clamping of the aorta could be used, and has devised an instrument for this purpose. He states that in dogs the aorta may be clamped for as long as 24 to 110 hours without causing permanent changes in the parts below the obstruction. More lately, Robert T. Morris (*Annals of Surg.*, 1902, Vol. 35, p. 207) records a case in which he used a distinctly new procedure—namely, temporary distal ligature by means of a rubber catheter passed around the aorta at a point two inches below the aneurysm, and one and a half inches above the aortic bifurcation. He removed the constricting band in 27

hours, the aneurysm being completely consolidated, but unfortunately the patient died three days later from sepsis due to sloughing of a piece of intestine which had been injured by the clamp that secured the catheter. This method seems well worthy of further trial.

R. T. Stratton (*Annals of Surg.*, Aug., 1903, p. 256) records several experiments made upon dogs, and advocates the gradual occlusion of large arteries by means of a waxed tape, worked on the principle of an ècraseur, being tightened or rendered slack by means of a special instrument.

The latest suggestion which has been made is that of Rudolph Matas (*Annals of Surg.*, Feb., 1903, p. 161), who has devised and practices an operation in which, during proximal control of the circulation, the sac is laid open, cleared of clot, a portion isolated to represent the original vessel, and the rest of the walls enfolded by means of several layers of sutures. He has performed this operation successfully four times in aneurysms of the extremities.

R. T. Morris (*Annals of Surg.*, Oct., 1903, p. 493) has used this method in a fusiform aneurysm of the popliteal artery, and thinks that it could be easily applied to abdominal eneurysms. Doubtless many abdominal aneurysms are beyond receiving benefit from any form of treatment, but I think that, with a careful choice of one of the methods of operation mentioned in this communication, we may yet save a fair proportion of these cases which are by many considered doomed to certain death.

ON A NEW RETENTION SPLINT FOR CONGENITAL TALIPES EQUINO-VARUS, WITH SOME PRACTICAL POINTS ON THE TREATMENT OF THE DEFORMITY.

By DENIS KENNEDY, F.R.C.S.;
Surgeon to the Children's Hospital, Temple-street, Dublin;
Surgeon to Jervis-street Hospital, Dublin.

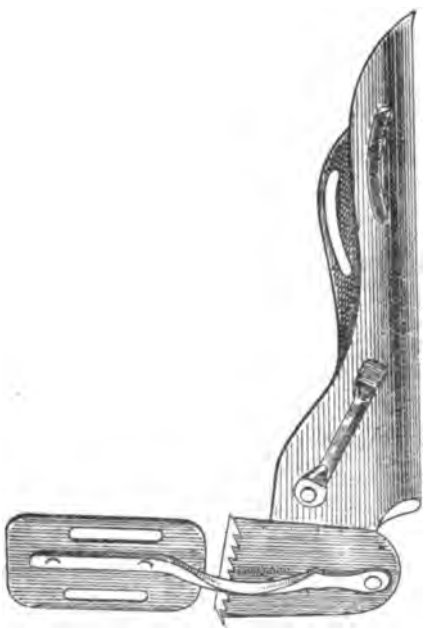
[Read in the Section of Surgery, January 22, 1904.]

My principal object in bringing the subject of congenital talipes equino-varus under discussion is to introduce to you a new retention splint, as well as to offer some practical suggestions in the treatment of the deformity, and to criticise some of the methods at present in use. In order to do this satisfactorily, it is necessary to understand thoroughly in what the deformity really consists—in other words, the pathological anatomy. With the equinus part of the deformity I need not trouble you. You are all aware that it consists in the posterior part of the os calcis being drawn upwards by the tendo-Achillis, its anterior part being depressed, while the astragalus is tilted forward between the malleoli so that its superior articular facet is placed more posteriorly than normal. The varus part of the deformity is not, however, so simple. Instead of this deformity existing at the ankle-joint, it exists principally at the medio-tarsal joint. Whatever the cause, the cuboid and scaphoid, with the foot in front of them, are partially dislocated inwards from the os calcis and astragalus, and kept in this abnormal position by shortened tendons, ligaments and fasciæ. As well as this, the os calcis and astragalus have a direction from behind, forwards and out-

wards, which increases the medio-tarsal displacement, and renders the deformity more difficult to rectify. In consequence of this displacement of the bones, their facettes for articulation with each other and with the malleoli are placed in abnormal positions; and it is well to remember that a cure is not complete until the bones are in their normal position, without any tendency to displacement, their facettes developed in the proper situations, and the muscles and ligaments have accommodated themselves to the new condition of things.

In treating the deformity, the presence of the medio-tarsal dislocation seems to be frequently forgotten, and the efforts of the surgeon seem to be principally directed to rectify the varus deformity from the ankle-joint. The retention splints in use seem to be constructed on the same principle. To my mind this accounts very often for the prolonged treatment necessary, for relapses that often occur, and for the unsatisfactory results that we sometimes see. In the hope of remedying this state of things, I have introduced a retention splint, which I have used for a considerable time, and which has given me a great deal of satisfaction. The advantages which I believe this splint to possess are—first, eversion and abduction of the foot are produced principally from the medio-tarsal joint; secondly, while this eversion is being produced, the anterior part of the os calcis and astragalus are pressed inwards, and thus the tarsal bones are kept as nearly as possible in a normal position; thirdly, a powerful leverage is obtained which materially aids in correcting the deformity; fourthly, on account of the rachet arrangement, rectification of the deformity can be increased if necessary from day to day, and thus the ill effects of pressure are completely avoided. As well, the splint is simple, easily applied, and, what is equally important, very cheap. The points to be attended to in the

making of the splint are—first, the os calcis must be well gripped by the heel part; secondly, the rachet arrangement must be immediately behind the medio-tarsal joint; thirdly, the heel part must be low on the outside to allow for eversion. It must fit accurately, scarcely any padding being desirable, except the patient's stocking. The appliance can be used as a retention splint after operation,



either immediately or after removal of plaster of Paris. It can also be used in the treatment of cases before operation, or where no operation seems necessary. In these cases it may take the place of plaster of Paris, and this I consider to be of great service, because the application of plaster of Paris to the club foot of a young infant for any length of time has two great disadvantages: while it is

applied no manipulation of the foot can be carried out, and not alone will development of the muscles not take place, but actual wasting occurs.

The splint is not intended for a walking appliance. It has been made for me by Messrs. Smith & Sheppard, who have spared neither time nor trouble in carrying out my idea in every detail.

With regard to the operations carried out for the cure of talipes equino-varus, there seems to be practically no limit to the number; and when one begins to work at orthopædic surgery the difficulty is to choose between them. I know that was my trouble some five years ago. I believe that, in dealing with children at all events, many of these operations are quite unnecessary, and some are positively productive of great mischief. Consequently, you will pardon me if I briefly detail to you the steps that I usually carry out for the cure of this deformity, and which in my hands has been productive of very good results. When I consider it necessary to operate, I first do tenotomy of the tendo-Achillis, and, if necessary, the anterior and posterior tibial tendons. Then, if I cannot bring the foot easily into position, I insert a tenotome between the internal malleolus and the tubercle of the scaphoid, and cut subcutaneously the plantar fascia and some of the short muscles of the great toe. In the large majority of cases I can then bring the foot readily into normal position, and over-correct the deformity if necessary. I then apply plaster of Paris to the foot in the corrected position and leave it for three or four weeks; subsequently use the retention splint, and have massage and passive motion of the foot carried out a couple of times daily. When the child is fit to walk, I get him fitted with a walking appliance. I believe there is no case in a child that cannot be made perfectly well in this fashion, pro-

vided after-treatment is carried out by the parents for a requisite time.

Although, since the advent of aseptic surgery, there is not the same necessity for subcutaneous surgery in operating for talipes as formerly, still it has some advantages over the open method. First, when plaster is applied after the operation it can be done with much greater ease and satisfaction, and there is less danger of sepsis; secondly, the necessity for changing the dressing does not exist, and consequently the bones will be left undisturbed in their new position; thirdly, it is said by some that where open tenotomies are done there is danger of the tendon ends becoming engaged in the cutaneous cicatrix; and lastly, where there is extensive cutting of the plantar fascia or of the short muscle on the inside of the foot, there is much less danger of cicatricial contraction following when the skin is left unbroken. But I may add that I have no hesitation whatever in cutting a tendon openly if there is any difficulty or danger in doing it subcutaneously.

I am perfectly aware that many good authorities hold that section of the tendo-Achillis should not be done until the varus deformity is rectified for some weeks, to allow, as they say, for the unfolding of the foot to take place. Now, unless where pes cavus exists to a marked degree, I see nothing to warrant this procedure either clinically or pathologically. On the contrary, I consider this tendon should be cut first, and for the following reasons:- In some cases section of this tendon at once enables us to rectify the varus as well as the equinus deformity, and unnecessary cutting is thus avoided. It is impossible in almost all cases to rectify the varus deformity until the tendo-Achillis is cut, because in those cases the tendo-Achillis is inserted into the inner aspect of the tuberosity of the os calcis, and this tilts the anterior extremity of the

os calcis outwards, and so long as the tendon remains uncut, the os calcis cannot be brought into position. Lastly, it saves time.

What is all important to produce the necessary unfolding of the inside of the foot in those cases is that the plaster of Paris be applied properly after operation. To do this an assistant grasps the anterior part of the foot with one hand, abducts and everts it, while with the other he grips the heel bone and presses its anterior extremity

Proper method of holding the foot for the application of plaster of Paris and for manipulation. One hand grips the heel bone.

inwards. The foot should be held in this position while the plaster is being applied and while it is setting. My retention splint keeps the foot in the same position afterwards. Manipulation of the foot should be carried out in the same manner.

The necessity for operating on the tarsal bones and the operations to be carried out are points that have given rise to a great deal of discussion in text-books, and to a good deal of anxiety in operators. After a fairly good experience, I am firmly convinced of the following facts:—First, that all cases in children under twelve years of age can be cured perfectly without any operation whatever on the

Usual method of holding the foot for the application of plaster of Paris and for manipulation. One hand grips the ankle-joint above the malleoli.

tarsal bones; secondly, that many older cases can be cured without it; thirdly, that tarsectomy is dangerous, and usually does more harm than good to the foot as regards utility; fourthly, that the only tarsal operations justifiable or that give good results are Bradford's—namely, osteotomy of the neck of the astragalus, and removal of a

wedge-shaped piece of the os calcis on its outer and anterior part.

When we remember that the tarsal bones in children are nearly altogether cartilaginous, and that, consequently, with a little perseverance they can be moulded into any shape we wish, it is at once apparent that removal of any of these bones is quite unnecessary; and when we see the after-results of the operation—the shortened, stiffened feet without a trace of elasticity or movement at the tarsal joints, or sometimes even at the ankle-joint—I consider the procedure a little short of criminal. Nevertheless, I frequently see the astragalus removed, or a wedge-shaped piece of the tarsal bones taken from the outside of the foot, for an ordinary case of varus in a child. The great arguments put forward in its favour are that it saves time in the cure and that relapses will not occur. The answer to these is, where the bones are removed no cure is or can be effected, and the same arguments could be put forward in favour of amputating straight off. The two great points to be remembered in treating this deformity are—that we must make the foot as useful as possible and give it a good appearance, the appearance being secondary to the utility.

The best workers of the present day at orthopædic surgery condemn tarsectomy. Mr. Keetley quotes the case of a man with double congenital talipes equino-varus; one foot had been subjected to tarsectomy and the other left untreated. The patient found the untreated foot more useful than the other. Tubby says that "tarsectomy should be done only when orthopædic treatment has been tried and failed; when progression is impossible, owing to severe pain and the pressure of inflamed corns, and bursæ, and ulcerated skin."

Sometimes I am asked, What is the proper age to operate

on infants with club feet? While we cannot make any hard and fast rule as to the age, because a great deal depends on the progress that can be made by manipulation and retention appliances, still, if operation has to be done, I think the earlier it is carried out the better, because cure can be effected with greater ease, the more perfect will be the result, and the shorter will be the time. If milder treatment is not satisfactory, tenotomy need not be delayed after the infant is three months old.

In treating talipes we must remember that half cures are no cures, and that no matter what operation we do, or how fully we rectify the deformity, the tendency to relapse remains for a considerable time. Consequently, the after-treatment of club-foot is all essential. It consists in massage and passive motion of the foot daily, and in providing the patient with a good walking appliance. I find this occasionally the most difficult part of the treatment. As a rule the majority of parents when told what to do, shown how to do it, and impressed with the necessity of having it carried out, are very willing to co-operate. The great difficulty is with the instrument makers. The appliances for walking are expensive, complicated, go out of order frequently, and the child outgrows them. Besides, a good many of them are not entirely satisfactory in keeping the foot in good position. The best in the market is undoubtedly Bradford's.

Some of you may possibly think that a discussion on the treatment of congenital club-foot is unnecessary, and anyone who takes the recorded results as gospel will agree with you. But while fully convinced that every case of congenital talipes in a child can be cured perfectly, nevertheless we frequently meet cases that go from one surgeon to another, from one hospital to another, and even from one country to another, and are still uncured. At the present

moment I have under my care a boy, aged nine years, who was twice operated on in a London orthopædic hospital. Quite recently I had another boy, aged ten, who was operated on several times in Johannesburg, and I occasionally even get cases who have been previously operated on in Dublin. And as an excuse for my present communication to you, I cannot do better than quote for you the remarks of Bradford, of Boston, on the treatment of club-foot:—"The literature of the treatment of club-foot is, as a rule, that of unvarying success; it is often brilliant, and yet in practice there is no lack of half-cured or relapsed cases—sufficient evidence that the methods of cure are not universally understood."

OBSERVATIONS ON SUPRAPUBIC PROSTATECTOMY.

By SIR THORNLEY STOKER, M.D., F.R.C.S.;
President of the Royal Academy of Medicine in Ireland;
Surgeon to the Richmond Hospital, Dublin.

[Read in the Section of Surgery, January 22, 1904.]

The performance of suprapubic prostatectomy is of such comparatively recent origin, and is as yet so much in course of development, that I have an apology for recording the small number of three cases. I do so because every example of an operation of such magnitude is an item of some value. Besides, although I have done but three prostatectomies by this route, I have performed a large number of suprapubic cystotomies for other diseases; and the treatment of the bladder after every suprapubic opening is a matter of importance, and one in which so much is learned by experience, that I wish to describe not only the method I have followed in dealing with the prostate gland itself, but also the points of interest in the treatment of the wound and the bladder during and subsequent to operation. The mere removal of the gland is usually a more easy and simple matter than the after-treatment of the case. I have had the advantage of assisting Sir William Thomson at most of his prostatectomies, and have added to my experience in that way. The description of his technique by a surgeon may be interesting to his colleagues, and I offer mine with every respect, knowing how in my own surgical work I have been helped by a practical account of details.

When the bladder is diseased and the urine alkaline, and when delay in operating is permissible, it is of great advan-

tage to get them into a better condition by the use of a white diet, by washing, and by the use of such other measures or drugs as may appeal to individual surgeons.

I propose to speak first of the removal of the prostate when the bladder has been opened, and afterwards of the method of opening the bladder, and the treatment of the parts subsequently. The two latter matters are common to all suprapubic cystotomies and hang naturally together, so I take the first of them out of its sequence.

When a full-sized flexible catheter has been introduced and the bladder opened, the operator standing on the left of the patient, the prostate should be thoroughly examined with the index finger of the right hand in the bladder, assisted by the left index, or the left index and middle fingers if necessary, in the rectum; great care should previously have been given to the cleansing of the rectum. Owing to the necessity of having at least one finger in it during most of the time occupied in enucleating the prostate, ideal cleanness cannot be achieved without the use of a rubber glove for the rectum, and this lessens the delicacy of manipulation.

During this examination the surgeon must determine whether one or both sides of the gland require removal, and whether some myomatous outgrowth may not have been the cause of obstruction and its removal suffice to open the passage for urine. If the prostate itself is essentially enlarged, or if a nodular condition of the gland due to separate capsulated tumours of an adenomatous or a myomatous nature exist, the entire gland should be removed. If any partial operation be done in such cases, a fresh development of some of these tumours is likely to occur later on and produce fresh obstruction. In one of my cases the obstruction to the urine, which was complete and acute, was not due to the general enlargement of the gland but

to a projecting nodule not much larger than a pea; the gland itself was full of such small tumours, and had it been left behind there is no doubt that sooner or later a fresh obstruction would have taken place either from the growth of such a nodule or from the general gland hypertrophy When this latter condition exists, I believe it always produces obstruction by lateral approximation of the lobes of the gland towards the middle line so as to press one against the other. The so-called middle lobe I do not believe in, and I think that the outgrowth of a separate adenoma or myoma is what has been so christened.

When the prostate has been thoroughly examined the left index, washed after its removal from the rectum, is placed in the bladder and used as a guide for a pair of blunt-ended scissors, which should be used to snip through the floor of the bladder and capsules of the gland, on one side of the middle line in an antero-posterior direction. This incision should be made over the most projecting part of the larger of the two lobes. It may be found that the whole gland can be delivered through one incision, but if the lobe first incised comes away without its fellow, a second and similar cut can be made on the other side and the remaining lobe disencapsuled. I think it is of the utmost importance to make the incision of sufficient depth, not merely seeking to divide the bladder wall and fascial capsule of the prostate, but to cut for a short distance through its proper capsule into the gland substance. If it be merely sought to expose the gland without injury to its substance, the operator cannot be certain whether he has thoroughly divided its coverings so as to render its enucleation easy. I hold strongly—and have formed the opinion as the result of anatomical as well as surgical observation—that the safest and most easy way to be sure that you are within the capsule of pelvic fascia, and in a region where

enucleation can be safely and rapidly effected, is to snip with your scissors into the substance of the prostate.

The incision I have been speaking of need not be more than 1 in. in length, enough to admit the end of a finger easily; any increase of its size can be effected by tearing with the point of the finger. It will be found after the removal of a large prostate has been effected that the incision or rent in the bladder wall has contracted to a very small size. The scissors are then withdrawn, the left index, with the middle finger if required, again placed in the rectum, and the right in the bladder. The process of enucleation is effected as rapidly as possible, the left fingers being used for counter-pressure and for the protection of the rectal wall from perforation or other injury. In one case I enucleated a prostate weighing $4\frac{1}{2}$ oz. in five minutes. I have seen much difficulty experienced in enucleating a sclerosed prostate, but in most cases five to fifteen minutes suffice for this stage of the operation.

The question of attempting to conserve the prostatic urethra generally settles itself. The urethra may be so glued to the gland that it separates with it, and comes away attached to the prostatic substance. The prostatic urethra may come away with a soft and easily disencapsuled prostate, and, on the other hand, may remain intact in a case of old and hard hypertrophy. Records seem to show that cases do just as well in which the prostatic urethra has been removed as those in which it has been preserved. Inasmuch as the chief source of hæmorrhage in this operation is from veins between the bladder and fascial capsule or between the fascial capsule and the true capsule of the gland, we will find another reason for getting well into the gland so as to avoid extensive injury to them.

When the prostate has been removed, the bladder should be irrigated with hot water to remove clots and check any

oozing which may be present. As a rule, hæmorrhage gives no trouble, but if it should occur subsequently to a grave extent a repetition of the irrigating process will usually stop it, and it is in view of this being necessary that one reason is found for leaving the bladder and abdominal wound as open as possible. In this context it may be remarked that the bladder generally contains a good deal of clotted blood for two or three days subsequent to operation, and it is by no means desirable to be too diligent in removing it. Its presence seals the large veins about the prostatic area, and limits both the tendency to bleeding and to septic absorption, so that it is not well to make much effort to remove clots. The urine has a rapid disintegrating effect on them, and they are soon got rid of without effort. I seldom use more than the most gentle syringing of the bladder through the wound for some days after a suprapubic operation. When more energetic washing is called for, it is best effected by injecting boric lotion through a catheter introduced by the urethra, and allowing it to discharge through the abdominal wound.

I now pass to the method of opening the bladder above the pubes. The viscus should be thoroughly washed out, and about 4 to 8 oz. of warm boric lotion allowed, if possible, to remain in it But, even if its contracted state forbids this moderate distention, there should be no difficulty in finding it when the parietal incision has been made. For many years I have abandoned the use of Petersen's bag, as it is both unnecessary and a source of danger by the strain it puts on an unhealthy bladder. The parietal incision requires to be from 3 to 4 in. long, according to the thickness of the abdominal wall, and should extend to within 1 in. of the symphysis. Once the skin and the musculo-tendinous structures are divided, no more use need be made of the scalpel except to pierce the bladder

wall; all the tissues may be got out of the field and the bladder exposed by scratching with a half-blunt instrument, such as the point of Greig Smith's scissors. The peritoneal pouch seldom gives trouble, even when the bladder is contracted, and can readily be held up by the finger of the assistant or by a small retractor. The bladder is best opened by puncturing with a small scalpel, and passing into the opening the blades of Greig Smith's scissors. If these blades are then separated in a vertical direction, they may be used to tear the opening in the bladder to any necessary size, and while doing so to lift it to the surface, so as to enable the operator to insert his finger. If the opening requires further enlargement, or is difficult to tear, owing to hypertrophy of the bladder coats, it can be increased in size by snipping with scissors.

I then take a piece of thick silk which at each end is threaded into the eye of a large fully-curved needle; the point of one needle is passed into the bladder, and, guided by the left index, is made to pass forward through the bladder wall on one side of the incision, at its upper end and about $\frac{1}{2}$ in. from its edge, and then through all the tissues of the abdominal wall anterior to the peritoneum except the skin. This proceeding is then repeated with the second needle on the opposite side; no further use of this suture is made until the intravesical portion of the operation has been completed.

When the operation is ended and the bladder has been irrigated the suture should be tied, not tightly but with just enough force to approximate the opposed surfaces of the subcutaneous portions of the tissues at the upper end of the wound. It should be tied with a bow and the ends left long, so that it may be loosened if necessary. As it does not include the skin it causes no pain. The uses of this suture are as follow:—

1. By drawing the bladder and sides of the parietal incision together it effectually prevents any prolapse of the peritoneal sac.

2. It keeps the opening in the bladder accessible, so that a tube can readily be introduced and washing easily and safely performed if called for.

3. It prevents undue contraction of the bladder towards its floor, and provides space for the collection of a small amount of urine, so helping to limit the overflow, which at times wets the patient and causes trouble.

4. By fixing the bladder to the upper end of the wound, and keeping the peritoneal pouch above the area, it prevents any chance of the cicatrix being afterwards subjected to bowel pressure and becoming hernial; and it leaves a cicatrix in such a position and under such conditions that it may, if necessary at any time in future, be safely incised for access to the bladder.

The suture may be removed on the fourth or fifth day, when lymph exudation will have cemented the parts, and made the treatment of the wound a comparatively simple matter.

In performing a suprapubic cystotomy the endeavour should be to form a wound with its apex at the bladder and its base at the skin surface. It ought not, as a rule, be closed or sutured in any way, except by the solitary suture I have described. In cases where, owing to the presence of a large amount of fat, the incision through the superficial tissues has been extended much upwards, a single suture of silkworm gut may be introduced towards the superior end of the wound. Attempt to suture the bladder or parietal incision more fully is not only useless but is injurious, and helps to cause infiltration of urine.

Since I have adopted this method I have had entire freedom from the infiltration of urine, which so often gives

trouble in the tissues of the abdominal wall or pelvis, producing suppuration and sloughing. Nor have I seen any trouble from the phosphatic concretions which may cause so much suffering and delay in the process of healing.

When the operation of cystotomy has been completed a rubber drainage tube of large size is introduced; it should extend from the surface level into the bladder, but not touch its floor, as if it does it will cause pain resembling that produced by vesical calculus. It should be attached at the surface by a rectangular glass bend to a lighter tube, which is passed over the side of the bed into a receptacle for urine. The wound may be loosely packed with gauze, not for the purpose of occluding it, but in order to act as a conductor of urine and prevent infiltration.

A covering of cellulose wadding and a binder loosely applied, will, after the bladder clots have come away, suffice to keep the patient and the bed dry and prevent much suffering.

The wound when treated in this way heals in from three to four weeks, leaving a narrow cicatrix.

Case I.—B. O'B., aged sixty, a farmer, of medium stature, in spare, muscular condition, was admitted to the Richmond Hospital on the recommendation of Dr. Robert Creighton, of Ballyshannon, on October 6th, 1902.

Two years previously he had suffered from frequency of urination for a few weeks. The attack passed off without any stoppage of water, and he remained in good health until five weeks before his admission to hospital, when he was suddenly seized with complete retention, and up to the date of operation was unable to empty his bladder except with a catheter. When he came under observation his urine was slightly alkaline, contained a little pus and some consequent albumen, and had a specific gravity of 1020. His prostate examined by the rectum revealed a moderate general enlargement of the gland, most marked on the left side; a No. 11 (E) catheter was readily introduced.

Treatment by systematic catheterisation, by sodium benzoate,

and a white diet was used, and, his urine having become acid, the prostate was removed on October 15th.

The details of the operation and subsequent treatment were in this and the following cases essentially those already detailed.

Recovery was uneventful. A little vesical bleeding took place some sixteen hours after operation, and was checked by the introduction of adrenalin solution. The temperature was never very high, and was practically normal after the ninth day. On November 3rd—the nineteenth day—water was passed per urethram, and from this on the drainage tube was only used at night.

On November 12th (the twenty-eighth day) the man was allowed out of bed into an armchair, and from this date the tube was abandoned. The wound was quite healed when he left hospital on December 12th, 1902.

Examination of the parts in this case, both before and after their removal, showed that the general hypertrophy of the prostate had not as yet caused the complete obstruction to urination which existed, but that it was due to a small rounded outgrowth, about the size of the tip of a little finger, which projected into the prostatic urethra. Dr. Earl reports it as being a myoma, and weighing 16 gr. This little tumour explains the unusual circumstance of the sudden complete stoppage of urine in a case where a large catheter was easily passed.

The following is Dr. Earl's report on the parts removed (Fig. 1):—

"Right lobe, weight 210 gr., length $1\frac{7}{8}$ in.; small round mass, 16 gr., circumference $4\frac{1}{4}$ in. Two masses of left lobe—one weighs 239 gr., length 2 in., circumference $4\frac{1}{4}$ in.; second weighs 142 gr., length $1\frac{7}{8}$ in., circumference 4 in.

"The total weight, therefore, is 11 gr. less than 2 oz. The small round mass is a myoma. There is no glandular tissue contained in it, and only a very small quantity of fibrous connective tissue. The other portions of tissue all show a similar structure. On section they exhibit a number of rounded areas, which are separated from each other by a small quantity of tissue which has not the yellowish tinge the rounded areas have. These rounded areas, on microscopic examination, are found to be composed mainly of tubular glands lined by columnar epithelium with a small quantity of fibrous and muscular tissue lying between them—that is, are adenomata. The tissue lying between the adenomata has the appearance of normal prostate."

Finally, as regards this case, Dr. Creighton, writing on October 10th, 1903, reports the man in his former vigorous health, retaining his urine for normally long periods, passing with a large stream, and having full control of his bladder.

Fig. 1.

Case II.—A. B., a gentleman, aged sixty-five years, sent to me by Dr. Goff, of Dundrum, suffering from prostatic obstruction and stone in the bladder, came under my observation in May, 1901. I then removed by litholapaxy a calculus weighing about 90 gr. I hoped that the prostatic enlargement, which seemed to have been provoked by the presence of a stone and which had begun synchronously with the rational evidence of its presence, would, as we sometimes see, diminish when the cause of irritation had been removed. But it was not so, and eventually worn out by the torment of a catheter life, the patient submitted to operation on September 1st, 1903. He was in a soft leuco-phlegmatic condition, his health being lowered by constant urinary distress. There was always a large quantity of residual urine, and the secretion could only be kept neutral or slightly acid by the use of drugs and by washing the bladder.

The operation was done on September 1st, 1903. It was rapid and easy, not more than ten minutes being occupied in enucleating the prostate. A little urine was passed by the natural channel on the tenth day and gradually increased until the twenty-first day, when the tube was withdrawn during the day and only used on occasional nights. On the twenty-seventh day the patient was allowed up for a short time. From this on he only passed water every fifth hour, and finally left the private hospital on October 20th, forty-nine days after the operation, the wound being healed and his urinary functions in a perfectly normal condition. The convalescence was delayed by a short intercurrent attack of pneumonia. I saw Mr. A. B. on January 15th, 1904, when he visited me at my house in perfect and vigorous health.

Dr. Earl reports (Fig. 2): "The right lobe weighs 1,332 gr., and measures 2¾ in. in length; the left lobe weighs 631 gr., and measures 2½ in. in length. The total weight, therefore, is 4½ oz., less 27 gr., and the total circumference a little more than 8½ in. Sections were made from each lobe, and portions adhering to their surface were also examined. The lobes have the general structure of the prostate, but the glandular tissue is more abundant than normal. Some small elevations on the surface of the lobes are composed of glands very much dilated. The tissue adhering to the surface of the lobes is fibrous. It contains no glands; one of the pieces examined contains some of the lining membrane of the urethra." With reference to the urethral membrane, I was not

aware, either during the operation or from the subsequent progress of the case, that it had been injured.

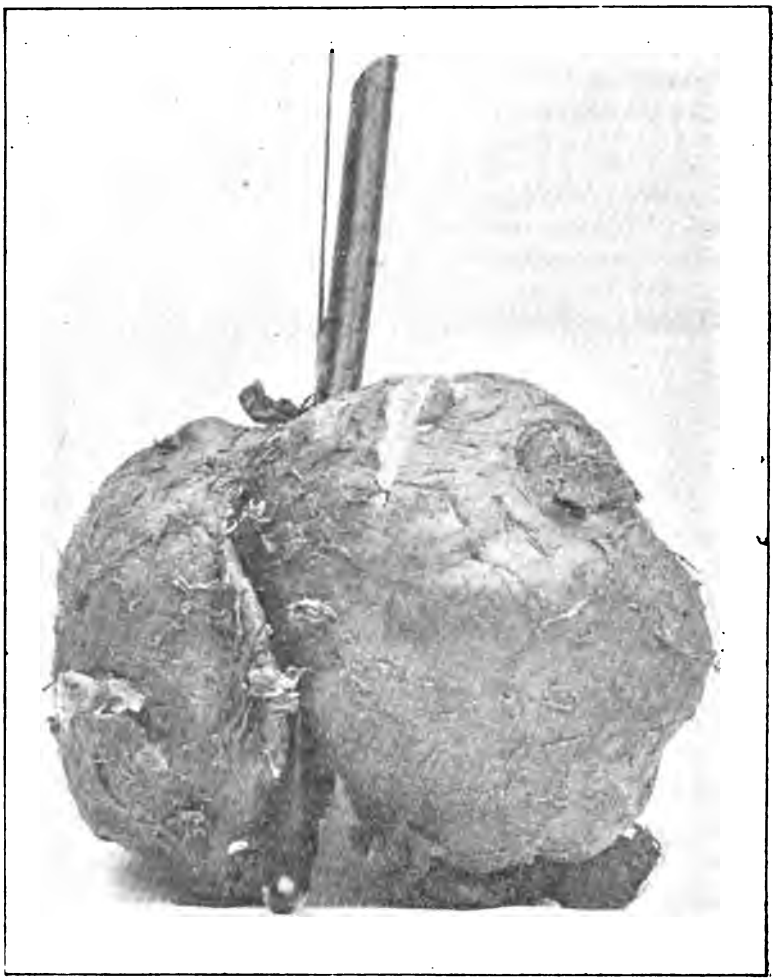


Fig. 2.

CASE III.—C. D., a gentleman, aged about fifty-eight, was sent to me in January, 1904, by Dr. M. O'Malley Knott, of Castlebar, and Dr. Allman, of Westport. He had suffered for four or five

years from gradually increasing prostatic irritation, which assumed the form of urethral obstruction about two years ago, and has since been increasing in degree. The urine was faintly acid, and contained a little pus and albumen, but no tube casts. The amount of residual urine was never less than 24 oz. The prostate examined

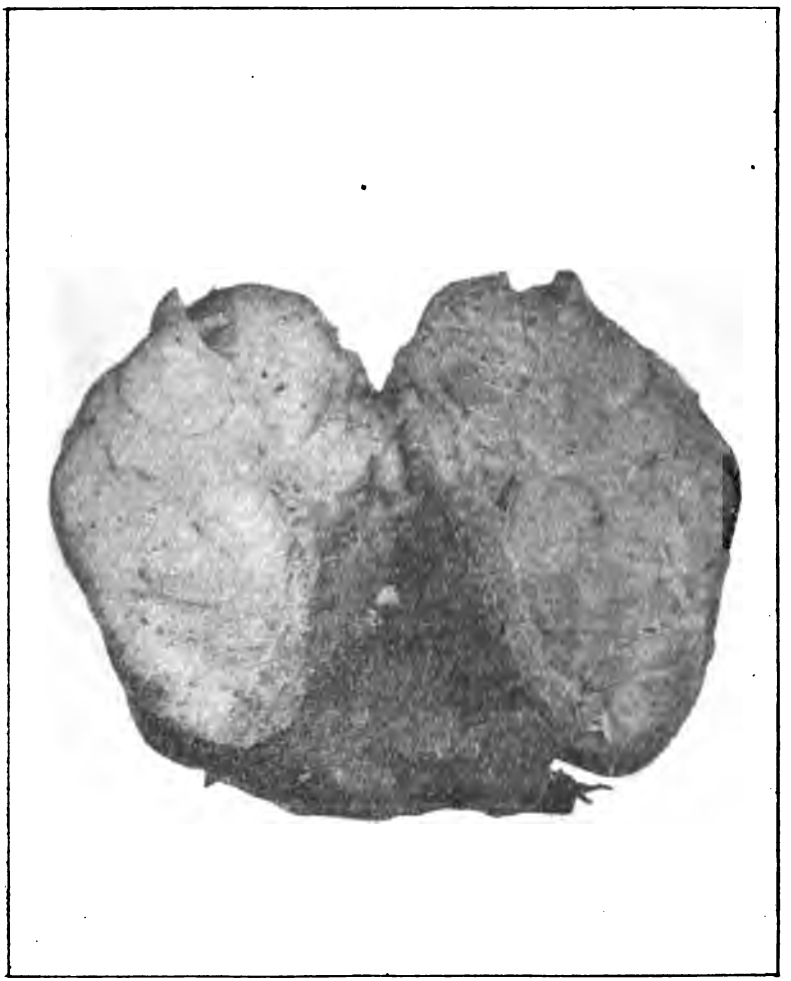


Fig. 3.

by the rectum did not seem to be much increased in size, but was distinctly larger on the left than on the right side. A No. 12 (E) catheter passed without any resistance. The catheter had not been previously used except on one occasion about a year ago for the purpose of examination. The patient could not pass any urine except when lying down on either side, it then dribbled slowly away. From these conditions I expressed the opinion that a pedunculated growth was present without much hypertrophy, and this was found to be the case.

I operated on January 16th, 1904, feeling some anxiety owing to the low condition of the patient and the shabby state of a somewhat exhausted heart, and found a prostate slightly enlarged on the left side, not at all hypertrophied on the right, and with a small flabby growth ¾ in. long, with a broad pedicle, growing from the prostate gland at the right side of the neck of the bladder, and movable in such a way that it effected the maximum of obstruction when the patient was erect, and the minimum when lying down; in the former position its action was valvular. I incised, enucleated, and removed this growth, finding, owing to its small size and flabby consistence, more difficulty in doing so than if the whole of an ordinary enlarged prostate were in question. No necessity existed for attempting to remove the gland itself. It was not the seat of any essential enlargement, and was not nodular. Indeed, I doubt if it would be possible, without inflicting grave injury, to enucleate a prostate in a normal or nearly normal condition as regards size and attachment, and which had not by growth freed itself to some extent from its connections.

The patient gave no cause for anxiety, except for the twenty-four hours following operation, when the weak state of his heart caused some alarm, until the thirteenth day, when his heart, which was a weak one, began to fail, and he died from cardiac exhaustion on the fifteenth day, the condition of his bladder being all through quite satisfactory.

Dr. Earl reports that "the part removed weighs 105 gr., and is an adenoma mainly composed of glands lined by columnar epithelium lying close together, and similar to those forming the prostate."

As the nature of prostatic enlargements seems still to be a moot point, I may be allowed to express my views,

founded on an extended observation of cases and specimens. There seem to be three conditions of senile enlargement:—

1. A true hypertrophy of the gland without any interstitial growths.

2. The existence upon and within the substance of the prostate of one or more encapsuled tumours, distinct from the substance of the gland proper, and either myomatous or adenomatous in structure. Both forms of neoplasm or one only of them may be present.

3. A mixed condition of true hypertrophy and interstitial growths of the second class. This condition is much the most common. The tumours may eventually reduce the prostate to a state of pressure atrophy, or cause it to become a mere capsule for adventitious growths. It is the latter condition which in all probability has given rise to so much dispute and uncertainty as to the true pathology of enlarged prostate. The third of the figures represents a section of one of the lobes seen in Fig. 2, and shows the appearance of the prostate studded with these growths, which are nearly always of a spherical form, and only depart to more irregular outlines when they become of large size or approach the surface of the prostate.

FIFTY CONSECUTIVE CASES OF EXCISION OF KNEE, WITH A HISTORY OF AFTER RESULTS IN MANY OF THE CASES.

By R. F. TOBIN, F.R.C.S.;
Surgeon to St. Vincent's Hospital, Dublin.

[Read in the Section of Surgery, February 26, 1904.]

I ASK leave to lay before you an account of fifty consecutive cases of excision of the knee-joint performed by me in St. Vincent's Hospital, between 1894 and present date. Of these one died from the combined effects of sepsis and shock; forty-nine walked out of the hospital with useful limbs.

Wishing to know the after results of these operations, I addressed last October to each patient who had had two years' experience of the new conditions—forty-one in all—the following questions on a tabular form, and an addressed envelope for reply:—

1. Is your leg operated on by me at St. Vincent's Hospital on— —free from pain?
2. Is it straight?
3. Is there any discharge from it?
4. Can you walk upon it, and if so, say whether *well*, fairly, or badly?
5. What is the condition of your general health?

To forty-one letters sent out I received thirty-two answers. Of these twenty-four (75 per cent.) described themselves as perfectly cured and walking well. Seven mentioned some short-coming, which, although not bad enough to make them wish for further treatment, prevented their inclusion in the list of perfectly cured. Only one

was found to be doing badly In this instance the limb, subsequent to the patient's discharge from hospital, had become bent, and suppuration had set in. As regards the eight who did not reply, second-hand news I received was favourable. For instance, two, I was told, had emigrated to America; others had got employment as domestic servants and had left home. Taking, then, the replies received as an indication of results, we find that of thirty-two patients, twenty-four, two years after the operation, described themselves as in every way well; seven had some slight short-coming; one was not progressing favourably.

Before I pass from the question of results, may I submit for inspection the answers received, and remind you that at our last meeting but one I showed all the cases of two years' standing that happened to be in this neighbourhood (ten in all) and that without exception they had good useful limbs.

These results, I must confess, are much better than what I obtained antecedent to the date I have mentioned; and as I attribute them to an operative procedure then introduced by me, I shall take the liberty of describing it to you.

It is distinctive only in the method of keeping the bones in apposition. The splint I employ is that introduced by Sir W. Thomson. I have it fitted to the sound limb, and make the patient wear it thereon, so as to test it, for the twenty-four hours preceding the operation. In re-secting the bones I employ a broad-bladed saw. Two well-fitting, smooth surfaces having been so obtained, and all trace of diseased tissue having been removed, especially from the posterior aspect of the joint, this being a locality likely to escape notice and very inaccessible later on, I force, with the help of a brad-awl, a stout iron pin, about five inches long, into the tibia just below its tubercle, and in such a

direction as to make its point appear a little above the centre of the sawn surface. When it does so appear, I withdraw it and leave it flush. So much being done, I put the bones in apposition and apply the posterior splint, using plaster of Paris bandages. By sight and touch I ascertain whether the approximation is good. If it is not, I seek out and correct the defect; if it is, I drive home the dowel-pin, already in position, some two inches or so into the femur. This prevents lateral displacement. Now to prevent the bones being drawn apart—a thing likely to happen when the patient is pulled up in bed—calipers of the pattern I hand you are driven, one on each side, into holes bored in the condyles of the femur, or if much of the

condyles have been removed, into the bone above, an inch or so from the sawn surface, and into corresponding holes in the tibia. By means of the approximating screws the bones can now be clamped firmly together. The closing of the wound, insertion of drains, and application of the

anterior splint concludes the operation. The instrument to which I have given the name of calipers is a tool known by carpenters as a "spring divider," with the legs so bent that they are parallel when in position. The specimen which I hand round has been resected in the *post-mortem* room and the bones clamped together in the manner described. You see that a very secure fixation has been thus obtained.

The advantages claimed for this fixation by calipers, which may be likened to Malgaine's hooks applied to bone, is that they keep the parts in better apposition than any other means in use. Let us take the specimen before us and study it with a mechanical eye.

I say that the parts are here better secured than they would be, say, by a few wire sutures: 1st. The points of the calipers are inserted in a part of the bone that is hard. 2nd. The adapting pressure is applied exactly in the required direction and only in that direction. 3rd. You can, by a turn of the screw, increase the pressure at will. 4th. You can remove the pressure as readily as you apply it. (I generally remove the calipers on the seventh day and the dowel on the eighth.)

This *a priori* reasoning as to the excellence of the method is, I am glad to say, fully borne out in the results obtained by its use. It is my custom to take off the splint on the twentieth day, and any Vincent's men present will bear me out when I say that almost invariably the patient is found able, three weeks after operation, to lift the leg from the bed, the parts below the knee being unsupported. Children on whom I have operated have been able to do this after a fortnight. My present position as to the time of union is that I do not know at how early a period in an ideal case movement might be tried. The question is, given two broad, flat, well-nourished surfaces of bone kept

in accurate aseptic apposition, how long would it take for the establishment of firm union between them?

As regards the treatment of cases when allowed up, I think that every patient should, when walking, wear a support till the ossification of the epiphysis is complete. When one pictures to oneself a bone as long as the femur and tibia combined, and in the centre of that bone two points as weak as are epiphyses in the young, the necessity of some support is evident. To cases over twenty I have never given any sort of appliance on their being discharged, and their subsequent histories show that it would have been a mistake to have done so.

A FURTHER EXPERIENCE OF THE OPERATION FOR EXCISION OF THE GASSERIAN GANGLION.

By T. E. GORDON, F.R.C.S.;
Surgeon to the Adelaide Hospital, Dublin.

[Read in the Section of Surgery, February 26, 1904.]

Last year, at one of the Surgical Meetings of the Academy, I gave an account of a case of trigeminal neuralgia, for which I performed the operation of excision of the Gasserian ganglion. The removal was not complete, for I left the ophthalmic division and the inner part of the ganglion as well as the sensory root. Up to the present there has, in this case, been no return of the neuralgia.

Some surgeons consider this partial excision sufficient, and, therefore, to be preferred to the complete operation, which is more difficult and dangerous. It is, however, obvious that recurrence of the neuralgia is possible when any part of the ganglion with the sensory root remains intact. Moreover, if one aims at such partial excision one runs a chance of leaving behind the entire ganglion, or, at all events, much more of it than that belonging to the ophthalmic division. In the present case I made a determined effort to remove the ganglion in its entirety, with what measure of success I will narrate when I have given the clinical history.

The patient is a man aged thirty-one years. He was in good health until his present illness began. In June, 1902, he had his first attack of facial neuralgia. The pain had then a darting character—"not like ordinary toothache"—and was referred to his chin and to the front of the left ear. It began one day whilst he was taking his breakfast, continued for about three weeks, and was relieved by the extraction of two teeth. He remained

free from pain until Christmas of the same year. It is worth noting that the pain continued for two weeks after the extraction of the teeth, and during this time occurred as sudden single darts which caused his head to jerk to the opposite side.

The pain returned on Christmas Day, 1902, but was not very severe till May, 1903; thus, he could sleep and was able to continue his work.

In May it became more severe. In June he had several decayed stumps removed from the left upper jaw. This operation only gave relief for a couple of days. He saw Dr. James Little in October. The pain had continued since May, and would often occur every hour or even every half hour. Eating, speaking, or anything causing movement in his face, might induce an attack. He would sometimes rush away from his work when the pain suddenly seized him. His face would become flushed during the paroxysms, but there was no overflow of tears, nor did the face sweat or become swollen.

He was admitted to the Adelaide Hospital in November, 1903, and remained there till December 20th. During his stay in hospital he was given gr. $\frac{1}{6}$ morphia occasionally, and this was effective. He was also given the usual drugs for the cure of neuralgia, but these only gave temporary relief.

He went home for Christmas, but returned on January 1st. The pain was constant whilst at home, and had become more severe than at any time before.

The following is the note taken at the time of his re-admission to hospital:—

Since admission on January 1st has had bad pain each night, beginning at about 7 30. The pain is "much worse" than when here before. The act of swallowing appears to cause most pain. The pain is referred to two places in particular—(1) Just in front of the ear above the root of the zygoma; and (2) the chin, about the mental foramen, and a short distance along the lower jaw. The pain in front of the ear has a boring character. At times he gets a flash of pain along the gum of the upper jaw. He had running from both eyes for a couple of days before coming here. The only tender point is about the lower lip, and this is inconstant. There is no anæsthesia anywhere.

Such is the history of the case. There are two points to which I draw special attention. The first is the age of the patient; he is much younger than the large majority of cases of trigeminal neuralgia; the second concerns the distribution of the pain; as is usual the third division of the nerve is that principally involved, but there was also, at times, pain in the area of the second division. I do not think there was at any time pain in the branches of the ophthalmic nerve.

Seeing that this patient was, so far from improving under drug treatment, gradually becoming worse, Dr. Little placed him under my care, and I operated on January 7th.

As in the last case, so now I performed the Hartley-Krause operation. Last year I gave full details of this method, so that I may now only point out the general features. I turned down a temporal flap and opened the skull with a ¾ in. trephine in the upper and back part of the exposed area of bone. This opening I then enlarged to the requisite extent with suitable forceps. Next I retracted the dura as far as the openings in the skull for the passages of the two lower nerve divisions and the middle meningeal artery. All this was accomplished easily and quickly, but the remainder of the operation proved difficult. This difficulty arose from hæmorrhage. This can usually be controlled by plugging the foramina, and tends to stop of itself as a result of the lowered blood-pressure, which is caused by the shock of the operation, but in the present case the bleeding was not thus controllable. I think this was in great part due to the age and vigour of the patient. However, I succeeded eventually in thoroughly opening up Meckel's space and exposing the nerves and ganglion. I also succeeded in evulsing much of the sensory root after dividing at their foramina the 2nd and 3rd divisions of the nerve. I thought I had removed the whole of the sensory root, but in this I was mistaken, for the patient retains sensation over the entire ophthalmic area.

The patient's recovery is so far complete, and seeing that pain was probably at no time felt in the area of the first division, one may hope that the neuralgia has been permanently cured. For

some days after the operation there was a partial loss of memory for words, and also a diplopia, which Mr. Swanzy, who kindly examined him for me, found to depend on a loss of power in the inferior rectus.

Now, although this case is so far successful, and may be permanently so, it can scarcely be claimed as a complete success from the operator's standpoint. I intended to remove the ganglion completely, and I left behind the ophthalmic part of it with its central and peripheral connections.

I have now something to suggest which I think I have learned from this operation and from an operation on the cadaver which I have done since. Let me again insist on the importance of complete excision of the ganglion. The cause of the neuralgia is a neuritis—a neuritis ascending from the periphery—and when the pain extends to the area of other divisions of the nerve such extension is due to a spread of the choice inflammation to this other division by way of the Gasserian ganglion. Now, if these statements are true, and I have the very best authority for them, then it follows that if any part of the ganglion remain inflammatory change may continue and spread to the remaining ophthalmic division. As further argument against partial removal, let me again say that if the operator aims at removing only the outer part of the ganglion he may fail to remove any part of it. This is not imaginary; it has, as I think I said last year, actually happened in operations performed by good surgeons. But, without supposing so extreme a case, if any of the cells remain which belong to the lower divisions of the nerve, from them fibres may grow outwards and with a restoration of function there may be, indeed probably will be, a return of the neuralgia. I have so far spoken of the relation of the ganglion to the nerve divisions; its relation to the great sensory root is different.

If the entire sensory root has been successfully torn from its attachment to the pons, nothing is more improbable than that the ganglion cells should ever again establish a central connection. It seems, then, to me that the chief aim which the surgeon should have before him in performing this operation is the isolation and complete evulsion of the sensory root. You will remember that in the operation, as usually performed, the space of Meckel is opened by splitting the dura between the foramen rotundum and foramen ovale, and the dissection of the ganglion is carried out mainly from before backwards. Thus it happens that the operator reaches the sensory root as a final step in the operation, and when his mind is much fatigued if, as in this case of mine, the dissection has been difficult owing to hæmorrhage. My suggestion is that Meckel's space should be opened from the foramen ovale in a backward instead of a forward direction. The middle meningeal artery must, of course, be divided, but this is a matter of no importance. Having opened the space in which the ganglion lies in this way, I propose, in my next operation, to at once proceed to the identification and separation of the sensory root. If, then, the evulsion is well done I think one might leave both the ganglion and the nerve divisions untouched.

Having put forward this suggestion, the main purpose of my paper is accomplished. The suggestion is briefly this—A complete evulsion of the sensory root will produce the same effect as removal of the ganglion, and the effect will be permanent. This being so, the operator should from the first aim at the isolation and evulsion of this sensory root, and it might simplify the operation to open the space of Meckel behind the foramen ovale and third division of the fifth nerve instead of in front of it.

PERFORATION OF ABSCESS OF A MESENTERIC GLAND.

By ALEXANDER J. M. BLAYNEY, M.A., M.B., B.Ch.;
Surgeon, Mater Misericordiæ Hospital.

[Read in the Section of Surgery, March 25, 1904.]

My object in reading this paper to you this evening is to place on record a case of peritonitis which must be unusual, as I have not been able to find an account of any similar case. The details are briefly as follow:—

P. D., draper's assistant, aged seventeen; was admitted to the Mater Misericordiæ Hospital on September 15, 1903, suffering from intense pain in the abdomen, which had come on about four hours before admission. Family history was stated to be good. He himself had been quite healthy till about five months previously, when he began to suffer from pain chiefly located about the epigastric region. This pain was felt, as a rule, after taking food, though sometimes it would come on some time before food had been taken. It was usually accompanied by headache and sometimes by vomiting. For about a fortnight before admission to hospital the pain had been more severe. On the morning of the day of admission, about eight o'clock, he was suddenly seized with a violent pain in the epigastrium which made him feel faint and sick. Notwithstanding this, he took his breakfast, but vomited immediately afterwards. The pain now became much more severe, and he was brought to hospital, where he arrived about twelve o'clock.

I saw him soon after his admission and found him writhing with pain, his face drawn and anxious, his pulse small and rapid. From time to time he would cry out from the intensity of his suffering. His temperature was about 100.5°, his pulse-rate 100. His abdomen was retracted, extremely rigid, and tender on

pressure. These signs, together with the previous history of five months of pain, chiefly felt after food and accompanied by vomiting, and the sudden onset of the present attack, led me to diagnose the presence of a gastric ulcer which had perforated that morning. In this belief I advised an operation, which was readily assented to by the patient, who was willing to undergo anything which promised him relief from his agony.

He was rapidly prepared, and about one o'clock, or about five hours after the occurrence of the severe pain, I opened his abdomen by an incision about five inches long, terminating below at the level of the umbilicus. Somewhat to my surprise I found no extravasation about the stomach. Thinking that there might be a perforation on the posterior aspect into the lesser peritoneal sac, I made a slit in the gastrocolic omentum and examined that cavity, but here also the peritoneum was normal in appearance and extravasation absent. I had now to reconsider my diagnosis, and the next most probable region of origin of a sudden abdominal crisis which occurred to me was the vermiform appendix. With very little trouble I brought into view an elongated appendix containing three fæcal concretions, but quite free from evidences of inflammatory trouble. Before dropping back the appendix I was able, by stroking it, to cause the concretions to move into the cæcum. On letting the appendix go I turned over a loop of the ileum which had escaped from the abdomen in my search for the cæcum, and here, at length, I found the cause of disturbance. At the root of the portion of the mesentery corresponding to this loop was a ragged hole from which pus was issuing, and around this the peritoneum was in a state of marked inflammation. The transverse colon in the neighbourhood had attached to it by a narrow pedicle a small mass of inflammatory tissue, which I imagined was an inflamed appendix epiploica. This, I have no doubt, was adherent to the region whence now the pus was issuing, and it was the tearing away of this which had led to the leakage of pus and the train of symptoms I have described above. The pus was of a curdy nature, showing caseous particles in it, and further examination showed it was issuing from a mesenteric gland. Altogether there had been but a small amount of extravasation, and the area of peritonitis was very much smaller than the violence of the pain had led me to expect. The whole had been included in a circle of four inches radius. I proceeded to

enlarge the aperture into the interior of the gland, and then introducing a sharp spoon, I cleared out its contents completely. In addition to the puriform fluid there was a quantity of caseous material which was in part calcified. When the scraping out had been fully done, I dried up the peritoneal area around, cut off the pedunculated mass attached to the colon, and swabbed the area around freely with normal saline solution. As the extravasation was localised, no general flushing was attempted. I now packed some iodoform gauze into the cavity left by the clearing out of the gland contents, and brought the end of the gauze out through the lower angle of the wound. While doing this I could feel other glands, which were enlarged, but did not consider it a favourable time to deal with them. The abdomen was closed up with through and through sutures except where the gauze protruded. The after history of the case was uneventful. The temperature on the two nights following the operation reached 99.2°, but never afterwards rose above normal. The gauze drain was not disturbed for seven days, when it was rotated in the wound and withdrawn for about an inch. This process was subsequently repeated daily till it was completely withdrawn about five days later.

The patient made a rapid convalescence, and is now, I am glad to say, quite well.

I have very little further to add to the above short account. The primary trouble in this case was from the partly caseous and partly calcified condition of the gland—obviously tubercular. This, I believe, had some secondary infection engrafted on it leading to the formation of pus. Of this, however, I am not sure, as I had no culture made from the peritoneal exudate, but it seems to me somewhat improbable that tubercular infection alone would have given rise to such a marked inflammatory reaction as was present in the neighbouring peritoneum. The chief points of interest to me were—first, the remarkable resemblance of the previous history and the mode of onset and symptoms to those of perforated gastric ulcer, and, secondly, the extreme rarity of rupture of a mesenteric gland abscess as a cause

of acute peritonitis in one in apparently fair health, as evidenced by the absence of records of similar cases. The only circumstance related to this in the literature I have examined is the fact, mentioned by Osler, that occasionally in typhoid fever rupture of a mesenteric gland abscess may be a cause of peritonitis and death.

SOME POINTS IN THE SURGICAL TREATMENT OF ACUTE GENERAL PERITONITIS.

By R. CHARLES B. MAUNSELL, M.B. (Univ. Dub.), F.R.C.S.;
Surgeon to Mercer's Hospital, Dublin;
Member of Council, R.C.S.I.

[Read in the Section of Surgery, March 25, 1904.]

In the following remarks upon the treatment of acute peritonitis I do not intend to bring forward anything original; every measure advocated by me has been, more than once, advocated by others, but yet the general body of surgeons do not appear to grasp the necessity of some of these measures, in cases which they attempt to save, or else refuse to operate in advanced cases, being sceptical of their power to do good when certain well-known symptoms have appeared.

A few years ago I remember how despondently we approached a case in which intestinal distention was marked, and, after operation, how often we stood by whilst the distention yet further increased in spite of purgatives and enemata; how the purgatives were vomited and the enemata retained, thus adding more to the distress of the patient; then, when the dreaded "black vomit" appeared, gulped up without much effort, how we turned away from further interference, being thoroughly convinced that in this, at least, we had an infallible sign of fast-approaching and inevitable death.

About two years ago my attention was directed to the possibility of doing good in cases which had developed typical "black vomit." I had operated upon a man for acute peritonitis following perforated gastric ulcer. After the operation vomiting continued, and was "black"; the

patient showed signs of enteritis, with collapse, and died as if from ptomaïn poisoning. At the *post-mortem* the peritoneal cavity appeared clean, but the stomach was greatly distended with fluid dark in colour and putrid. This fluid appeared enough to kill any human being, quite apart from peritonitis, so I determined in future to try the efficacy of the stomach tube in similar cases. Not very long after this a patient, upon whom I had operated for appendicitis, developed signs of peritonitis with troublesome distention and copious vomiting of typical character. The stomach was douched clear every few hours for several days, and the patient recovered. Since then I have had a similar experience in gastric perforation cases, but I will not mention them in detail, as I have already dealt with this form of peritonitis at a previous meeting.

The method of dealing wth advanced intestinal paresis was also learned by watching and following to the *post-mortem* room a series of futile operations.

It is now allowed that the prognosis of peritonitis arising from gastric perforation, if operated upon thoroughly, is not bad, but I regret to say that the prognosis of general acute peritonitis from other causes has up to the present been very gloomy.

The following three cases, which have been under my care in Mercer's Hospital within the past two months, will serve as an example of the procedures which I have come to adopt, and as a text for any further remarks. The first case ended fatally on the tenth day after operation, but as it illustrates many points I have included it:—

Case I.—P. M'D., aged twenty-five, police constable, was admitted 9th January, 1904, suffering from acute peritonitis following appendicitis. I saw him with my colleague, Dr. Lumsden, under whom he had been admitted, and found temperature 100°, pulse 96, and poor quality, facial expression dull

and colour dusky; history of onset of agonising pain about fourteen hours previously, supervening upon a lesser pain referred to the right iliac fossa. The abdomen was very rigid, and the diaphragm much pushed up by distention of the intestines.

Immediate operation was advised. Whilst preparation was being made for this he vomited a quantity of mixed "black" and "fæcal" material.

Operation.—The ordinary oblique incision was made, and an intensely inflamed and perforated appendix was readily found and removed. A few drams of thin fæcal material and pus was mopped up with gauze, and the immediate neighbourhood cleansed with saline solution. Having re-cleansed my hands, the intestines were pushed aside and a large quantity of fæculent fluid removed from the pelvis. The oblique wound was temporarily closed with forceps, and an incision having been made in the middle line, above the umbilicus, the renal fossæ and cupola of the diaphragm were found full of a fluid similar in character to that which had filled the pelvis. The abdomen was next douched with several gallons of warm saline solution, poured from a jug, a hand being passed well above and behind both liver and spleen to ensure thorough cleansing of the diaphragmatic region. The distended large intestine was incised and thoroughly deflated, and the small intestine and stomach were similarly dealt with. The incisions in the intestines and stomach having been closed with a single continuous suture of fine silk, the abdominal cavity was redouched, and the parietal wounds partially closed, leaving space for gauze drains to the pelvis and renal pouches.

The patient passed a good afternoon and night, a large quantity of salt solution and serum draining away. Next morning, January 10th, pulse 108, respiration 30, temperature 98.4°. During the day the pulse and temperature rose and vomiting returned, so on two occasions I douched out the stomach, removing a large quantity of stinking "black" material. On January 11th, the pulse and respiration being still frequent, the stomach was douched as before, morning and evening, the colon washed out by enema, and the gauze-drains were removed. From this date vomiting ceased, the temperature soon fell to normal, the pulse gradually reduced in frequency, and the only thing causing anxiety was the peculiar hysterical condition the

patient assumed—shouting, often refusing food or medicine, and fighting vigorously with his nurses, although not in a condition of true delirium. On the evening of January 17th, nine days after operation, I had every reason to believe he would recover, but during the early morning of the 18th he struggled violently with those attending him, and a large amount of intestine prolapsed through the lower wound, which had given way under the strain.

The accident was not noticed until the binder was changed some hours later, when I was telephoned for, and returned the intestines, but the patient steadily sank during the day, and died, collapsed, at 9 p.m.

Although this patient was not out of danger, yet I had very reasonable grounds to hope for his recovery if this unfortunate accident had not occurred.

The second case is worthy of record as showing what extensive injuries a human being may receive and yet recover:—

Case II.—W. M., male, aged fourteen, was admitted to Mercer's Hospital, 7th March, 1904, at 5 30 p.m., with the following history:—He had been employed cleaning a window in a large boot factory. Close to the window was the shaft of a leather stamping machine, in which his apron became entangled. The apron was rapidly wound up, and the boy, held firmly with his lumbar region against the shaft, was whirled around as if upon a horizontal bar. At each revolution his legs and head alternately struck the window-frame.

When brought to hospital he was in a condition of profound shock, merely moaning and complaining of pain in the abdomen when roused. The right frontal, malar, and nasal regions were deeply bruised and showed superficial abrasions; the right conjunctiva was raised up by hæmorrhage, and a stream of blood flowed from the right ear. The legs and feet were covered with jagged cuts, some of which exposed the bones and ligaments. The 8th, 9th, and 10th ribs on the left side were broken at about their middle, and the percussion note and position of the heart beat pointed to a moderate amount of pneumothorax. The

abdomen was very tense and tender, and a very slight abrasion was present above and to the left of the umbilicus.

The boy was put to bed, hot jars applied, and the ear cleansed and packed with iodoform powder. Temperature 99.4°, pulse 104 and very weak, respiration 24. I strongly suspected intestinal or other visceral rupture, but in presence of a fractured base and fractured ribs I considered it necessary to wait for more complete consciousness to return before giving a definite opinion. I left word that if the pulse-rate, &c., increased markedly during the night I should be sent for. When I saw him next morning at 10 a.m. the record on the chart showed temperature 99.4°, pulse 108, but when I felt the radial pulse it was so weak and running that it could only be counted by exercising the greatest care, and a stethoscope revealed the fact that the true rate was 156 per minute. As the boy was now more conscious and the abdomen more rigid I determined to operate immediately

An incision in the mid-line below the umbilicus disclosed a quantity of blood-stained fluid and greatly distended intestines; a short search revealed undigested potato, &c., and intestinal contents free in the peritoneal cavity. The incision was rapidly extended upwards and a tear found in the jejunum, almost completely severing the gut; a hæmatoma as large as a fist was also present in the mesentery. Having satisfied myself that the circulation in the injured intestine was good, I mended the tear with a double row of silk suture, and then, having searched for any other lesion which might be present, thoroughly douched out the peritoneal cavity. I next opened the transverse colon and deflated it, then the ileum, fairly low down, and lastly, the distended stomach, which appeared at the upper angle of the parietal incision. When the stomach and intestines were perfectly flaccid the incisions were sutured, the abdomen again douched, and the parietal wound closed except at its lower angle, through which a gauze drain was carried to the pelvis.

The drain was removed on the second day, and the case ran an uneventful course, except for diarrhœa on the 4th, 5th, 6th, and 7th days, which was due to irritations from nutrient enemata, and was checked by starch and opium enemata.

The boy is now well, and has been on full diet for the past week but will have to be detained until the lacerated wounds on his

feet have completely granulated. [Since this was written the boy has returned home perfectly well.]

Case III.—G. C., aged nineteen, van driver, was sent to me, 11th March, 1904, with the following history:—

Three days previously, in the forenoon, he had been thrown from a spring van, falling with his legs between the horse and the shaft, and his abdomen across the shaft. He experienced great pain, and shortly afterwards vomited. He proceeded home to bed, and the pain and vomiting increasing a doctor was called in, who administered a hypodermic of morphia.

Urine was passed naturally next morning, but now the pain and vomiting became intolerable, and the urine had to be removed by catheter on two occasions. The bowels had not moved since the accident. I saw him in hospital on the morning of the fourth day after the injury. His pulse was 110 and poor, temperature 100°, respiration 24, face dusky, tongue dry and brown, abdomen very much distended and tender. A diagnosis of general peritonitis was easily made, and immediate operation advised. Before operation the stomach was douched out, removing a very large quantity of "black" foul-smelling fluid.

The abdomen was opened in the mid-line below the umbilicus, revealing tremendously distended intestines and a uniformly inflamed peritoneum. The distention was so great that, even when the incision had been enlarged, no methodical search could be made for the lesion which had caused the peritonitis. The large intestine, and subsequently the small intestine, was drawn out, freely incised and emptied, but the stomach was not opened in this case. A further search revealed a hæmatoma in the mesentery and transverse mesocolon and a generally inflamed peritoneum, which bled in many places when handled, but no rupture[a] of any viscus could be demonstrated, so I determined to thoroughly douche out the cavity and drain, as in the previous case. After operation a catheter was passed and drew off urine which contained a slight amount of blood. The urine obtained during the next thirty-six hours gave a faint reaction with the guaicum test, and then became normal.

[a] It is very probable that the peritonitis in this case was due to injury of the pancreas, which at operation lay behind the hæmatoma described as being in the mesentery and transverse mesocolon.

The patient passed a good afternoon, but during the night vomited a quantity of dark green material. Next day the pulse ranged between 100 and 112, and frequent and copious vomiting of "black" fluid set in. The stomach was douched clean at 2 30 p.m., and again in the evening, when vomiting had recurred.

During the early part of the night vomiting again recurred, and the stomach was douched on two occasions.

The history subsequent to this was uneventful, and the boy is now quite well and allowed to sit up. [Since this was written the boy has returned to work.]

In describing the treatment of these cases I have not referred to the ordinary stimulants, enemata, &c., &c., which are known to all, and are given according to indications, but I wish to draw attention to a few measures which are not generally adopted.

Advice which I have often heard, and which I used to give, was:—

(1) If a patient who suffers from general peritonitis is in fairly good condition, do a thorough cleansing operation; but if the patient shows signs of advanced infection either do nothing or else open and drain, doing little more for fear of hastening death.

(2) If you cut down upon a perforated appendix or stomach, and find what appears to be localised extravasation, mop it up, and do not explore the whole peritoneal cavity for fear of carrying infection to parts which might possibly be clean.

(3) Having operated, let the patient alone as much as possible, and if nature does not cure let him die as easy as morphia can render him.

My answer to advice of this kind now is:—

(1) Every patient who suffers from general peritonitis requires a thorough operation. The worse the symptoms are the more we must do to relieve them. When a patient is very bad we must not do less, but work more speedily.

It is no use interfering if we put a patient back to bed with a half-cleansed peritoneum and intestines full of poisonous and paralysing gases.

(2) To merely mop up what we *hope* may be a local extravasation and trust to *luck* is not surgery, in my opinion. There is far less danger in re-cleansing the hands and exploring the pelvis and upper abdomen if the symptoms have been at all general or if the limiting adhesions appear light in character.

(3) After operation give as little morphia as possible, and douche out the stomach repeatedly if vomiting or flatulent distention of the stomach are present.

With regard to drainage. In cases arising from stomach perforation, if they have been thoroughly cleansed, drainage need not be used, but in infection from other sources drainage by means of gauze is necessary, and, in spite of what many authorities say, large quantities of fluid drain away for 24 to 48 hours. The drain can be withdrawn on the second day after operation and the sutures tied.

ON A CASE OF EXCISION OF CÆCUM AND ASCENDING COLON.

By ALEXANDER J. M. BLAYNEY, M.A., M.B., B.Ch.;
Assistant Professor in Surgery, Catholic University Medical School;
Surgeon, Mater Misericordiæ Hospital.

[Read in the Section of Surgery, May 6, 1904.]

Operations involving removal of portions of the alimentary canal are now, thanks to the improvement in the technique of abdominal surgery so frequent, and the reports of successful cases are so numerous, that I feel I am making a large claim on your indulgence in asking you to listen to the details of yet another case. There are in it, however, one or two points of interest which, in my opinion, justify me in putting it on record. The details are as follow:—

H. M., aged forty-three, was admitted to the Mater Misericordiæ Hospital in September, 1903, suffering, it was said, from recurrent appendicitis. His previous history was that up to seven months before coming to me he had been quite well. He then began to suffer from attacks of pain, which were referred to the neighbourhood of the right iliac fossa. These pains were severe, lasted for a few days, and then disappeared. The intervals between the attacks were at first considerable—generally three or four weeks. For the last two months the pains had been more frequent, occurring about every ten days, and in the intervals the region remained tender to pressure. His bowels during the whole of this period had shown a tendency to be confined, requiring generally purgatives to make them act. He had not noticed any loss of flesh till about a month before his admission, but during this period he had noticed a distinct decrease in his weight.

On examination he was found to be a fairly well-nourished man, who looked his age, but nothing more. His appetite was

fair, his tongue a little large, and slightly coated. Heart and lungs were normal. The abdomen was slightly full, and in the right side a swelling could be made out, somewhat tender on pressure, and situated on a somewhat higher level than one would expect if it had its origin in connection with the appendix. A line drawn horizontally round the body from the top of the iliac crest would correspond to its lower limit. Bearing in mind the history of the repeated attacks of pain in the right iliac region, and the fact that he was sent to me to have his appendix removed, by a doctor whom I knew to be a careful man, the diagnosis of recurrent appendicitis was made, though there was a lingering doubt in my mind caused by the situation of the swelling.

Having ascertained that the urine was normal, I proceed to operate, with the assistance of my colleague, Mr. Lentaigne. I made the usual oblique incision for appendicectomy and, separating the muscular fibres, opened the peritoneal cavity. I then brought up the appendix into the wound, and found it somewhat thickened, and with some firm adhesions to the adjoining parts. These were separated, the mesentery tied off, and, following the course I usually adopt, the appendix was cut off flush with the cæcum, and the aperture so caused closed by a continuous suture of catgut. Although the appendix showed evidence of having been involved in chronic inflammation, I had not encountered any thickening sufficient to account for the tumour which I had felt through the abdominal wall, so that having disposed of the appendix, I proceeded to examine further with my finger. On passing it upwards, I found above the cæcum a hard mass occupying the wall of the ascending colon, and bound down to the posterior aspect of the abdomen, evidently cancerous in its nature. In order to get a full view of this, I enlarged the aperture in the abdominal wall, cutting through the muscles, which had previously been only split. The growth was then found to infiltrate the walls of the ascending colon immediately above the cæcum. It was obvious that to remove it completely it would be necessary to encroach considerably on the cæcum, and it seemed to me that the easiest course would be to remove the whole cæcum with the tumour, and to implant the lower end of the ileum on the large intestine above the growth. As this also recommended itself to Mr. Lentaigne, I doubly clamped the lower end of the ileum, and divided it between. I then proceeded to dissect up

the colon from the posterior abdominal wall, to which it was closely adherent, till I had freed it for about four inches above the tumour. The colon was then doubly clamped and divided. The lower end of the ileum, the cæcum, and ascending colon were now free, save where they were held on their inner side by the vessels. These having been tied off by three or four interlocking ligatures, the whole mass was cut away. There remained now the question of restoring the continuity of the alimentary canal, and this I decided to do by implanting the ileum on the transverse colon, as there was not a sufficient length of ascending colon left to which it might be attached. Before removing the clamp on the colon, a continuous suture of silk was passed through the walls as they were held opposed by the clamp, the loops passing over the blades of the latter and lying loose till after its removal. They were then drawn tight, one after the other, thus securely closing the lumen. A second row of continuous suturing, taking up muscular coat, was then inserted and drawn tight, thus burying the first line. It is interesting to remark here that a considerable area of the colon at this place is devoid of serous covering, so that the sutures brought together the muscular coats of the intestine without any interposed peritoneum. This condition of the large intestine is not so favourable for rapid union as when in the small, two peritoneal-curved surfaces are brought together, and, as will be seen later, some leakage occurred about this area. The colon having been closed the implantation remained to be done, and I used the Murphy's button to effect this. I believe that this is the ideal place for the use of this mechanical aid. The contents of the small intestine being liquid, no obstruction is likely to arise while the button is in position. When it has become free there is no proximal cavity into which it may fall, such as there is in the operation of gastro-enterostomy. The peristaltic action of the small intestine must drive it into the large, and the size of the button required is such that it will readily pass along the large intestine. There can be no question that with a properly made button the union, secured immediately, is more secure than that obtained by any method of suture, and, notwithstanding all statements to the contrary, the time necessary to complete the junction is much less than by any other method. I am not by any means an advocate for the frequent use of Murphy's button. I have seen very serious trouble follow on its employment, but I have

no doubt that for the implantation of the small into the large intestine it is much the best method.

The union between the ileum and colon having been completed, the area of operation was flushed out with sterile saline solution, a gauze drain was inserted down to the line of suture in the ascending colon, and the wound closed by through and through sutures of silkworm gut. The operation, owing to the preliminary appendicectomy, had lasted for some considerable time—about an hour and a half—but the patient was in a good condition when he left the table. The subsequent progress of the case was marked by but one complication—namely, that about four days after the operation there was some leakage of fæcal matter along the track of the gauze. I have already pointed out what I believe to be the reason of this—namely, the absence of serous covering from the ascending colon. It was this which led to my introduction of a drain here—a course which the subsequent leakage showed to be necessary.

The amount of fæcal matter was never at any time great; it consisted merely of a small quantity of fluid, with a slightly foul odour, staining the dressings a brownish colour. It did not interfere with the healing of the wound, which took place by first intention, except along the track of the drain. At the end of a fortnight the discharge ceased, and the fistula at once began to close. It is of some interest to note that the silk used in closing the colon did not come away, although it must have become infected by the discharge, nor did it subsequently give rise to any trouble. Probably it eventually worked its way into the interior of the bowel.

The button did not give any trouble. About a fortnight after the operation the patient complained to me that he had some slight diarrhœa, which I put down to the button having become lodged in the rectum, and on inserting my finger into the bowel this proved to be the case. It was easily hooked out by the finger, and the rectal irritation at once ceased.

The patient was discharged quite well, and has remained so up to the time I last heard of him, which was recently. He has increased in weight, and has had no pain or trouble since the operation. I have considerable hopes that he will remain free from recurrence, as a considerable area of intestine on each side of the growth was removed, and, in addition, it would seem from

recent reports that columnar-celled carcinoma of the colon, which the microscope showed to be the disease in this case, is not a very malignant form of growth. There have been many cases reported which remained free from recurrence and were still alive from five to ten years after operation.

I have little to add to the above brief account. I am much indebted to Mr. Lentaigne for his advice and assistance during the operation.

SECTION OF OBSTETRICS.

CLINICAL REPORT OF THE ROTUNDA LYING-IN HOSPITAL, FOR ONE YEAR, ENDING NOVEMBER 1ST, 1903.

By R. D. PUREFOY, M.D. (Univ. Dubl.), F.R.C.S., Master.

[Read in the Section of Obstetrics, January 8, 1904.]

During this year 1,992 women were admitted to the Maternity, of whom 1,694 remained under treatment, so that an annual increase in the number of admissions continues. Amongst the interesting cases will be found one closely resembling scarlatina, ending in perfect recovery; three cases of puerperal aphonia, one of paraplegia, arising shortly before the end of pregnancy; and one of missed labour, in which pregnancy lasted nearly 11 months, and was terminated by the abdominal removal of the uterus and contained fœtus. There was also a case of Cæsarean section, in which mother and child were saved.

Table No. I.—*Admissions to Maternity Department.*

—	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Total
Total deliveries -	120	139	129	120	142	130	134	145	171	150	160	154	1,694
Total abortions -	2	2	5	10	7	8	4	4	5	6	5	7	65

Table No. II.—*Dispensary for Out-Patients.*

Number of first attendances - - -	5,132
,, repeated ,, - - -	6,478
Total - - - -	11,610

TABLE No. III.—*Showing Nature and Number of Cases Treated in the Extern Maternity*, 1902–1903.

Total number of cases	2,045	Mania	2
Abortions	237	Mortality, maternal	5
Hæmorrhage—		Twins—	
Accidental	17	Females	11
Placenta prævia	11	Males	10
Post-partum	21	Male and Female	4
2nd Post-partum	1		—25
	—50		
Eclampsia	4	Triplets, 2 F., 1 M.	1
Hydramnios	8	Operations—	
Infantile conditions—		Curetting for abortion	124
Anencephalus	4	Forceps	60
Hydrocephalus	2	Manual removal of placenta	26
Talipes	1	Version	14
	—7	Decapitation	1
Moles—			—225
Hydatidiform	2	Presentations—	
Phlebitis	2	Breech	55
Mortality, infantile (born dead)—		Brow	4
Macerated	16	Elbow	2
Non-viable	23	Face	4
Premature	20	Footling	5
Recent	45	Occipito-posterior	21
	—104	Transverse	1
			—92
		Prolapse of funis	6

MATERNAL MORTALITY IN EXTERN DEPARTMENT; HISTORY OF CASES.

CASE I.—M. M., aged twenty-three, 1-para; delivery Dec. 19th. Patient was delivered, by natural efforts, of a dead child after a slow labour. The placenta came away in 12 minutes, but was followed by *post-partum* hæmorrhage, which could not be controlled by massage and ergot ʒiss by mouth. On arrival of clinical clerk the pulse was found weak, and the hæmorrhage continuing in a slow but steady flow. Massage was tried a little longer without effect. Then the uterus was curetted and douched with hot creolin solution. The uterus contracted well several times, but relaxed again, and the hæmorrhage continued. Douching was persisted in for a little longer, when the patient

suddenly collapsed, respiration failing, and the pulse becoming imperceptible. Patient presented symptoms of profound shock. Stimulation by strychnin was tried, but patient died in 10 minutes after the sudden change.

Case II.—R. O'H., aged thirty-seven, sixth pregnancy; January 13th. Patient delivered herself naturally. The placenta came away normally, but some membranes were retained. These were removed at time of delivery by fingers and douching. Owing to slight *post-partum* hæmorrhage occurring the uterus was lightly curetted. On third day, temperature 102.6°, pulse 112, the uterus was curetted and douched. Fourth day, pulse 102, temperature 101.8°. Fifth day, pulse 130, temperature 104.2°. Patient had developed phlebitis, and evidently had acute sepsis. Temperature varied from 105° to 100°; pulse from 120 to 140. This continued for ten days. The uterus was douched on several occasions, and patient kept on stimulants. She was greatly neglected by the friends who were supposed to be looking after her, but would not carry out any instructions given to them. The patient died on January 26th, the thirteenth day.

Case III.—Mrs. F., 3-para; first pregnancy normal, child lived two months; second pregnancy, five months, miscarriage. This pregnancy terminated in the eighth month. The child was born normally, but the placenta was retained for over an hour, and then had to be removed manually. There was then some very free *post-partum* hæmorrhage. The placenta was found adherent to anterior aspect of lower uterine segment. There had been no *ante-partum* hæmorrhage, and none during third stage until it had lasted for forty-five minutes. The placenta was with great difficulty detached, some parts being exceedingly fibrous in their attachment. During this the hæmorrhage became very profuse, so that manual efforts to remove some fragments were stopped, and hot douching used. This controlled the bleeding, and then some pieces were removed with a blunt curette. The patient was showing signs of collapse, so further efforts were stopped and the uterus douched and massaged, and then plugged with iodoform gauze. Saline injection by rectum was given, and also subcutaneously; pulse

154, temperature 96.8°. Nothing could be taken by mouth, as patient vomited each time. Three hours later—temperature 97°, pulse 132—another rectal injection was given, and patient slept. Rectal injection repeated with milk and alcohol. Next day—twelve hours after plugging uterus—the plug was removed and uterus douched; temperature 102.8°, pulse 160; complaining of great thirst; patient slept at intervals, was fed by rectal injections of egg and whisky. The pulse and temperature continued high for next day. For the next three days the pulse was very rapid, but the temperature had come down to 100.8°. Stimulants and iron were given regularly, but patient died on fifth day.

Case IV.—M. M., aged thirty-five, 14-para; delivered August 29th, after eight hours in labour, with a breech presentation. The child born to umbilicus with one arm down, the second arm was in the nuchal position, and was difficult to deliver. The head was extracted by the Prague method. Placenta born in twenty minutes, and patient appeared quite normal—pulse 86, temperature 99.4°. Sent for doctor two hours later, but patient was dead on arrival. No hæmorrhage had occurred since delivery.

Case V.—M. D., aged thirty-seven, 11-para; died undelivered. Patient sent up to hospital supposing herself to be in labour. Complaining of pain in abdomen; appeared normal; no bleeding showing; uterus apparently normal to palpate; pulse and temperature normal. On examination the os admitted two fingers, and the child presented by the head; membranes unruptured. Two hours later there was slight discharge of blood. When student was with case the uterus had become more tense, and the patient had become pale; the pulse and temperature were little altered. The case was diagnosticated as concealed hæmorrhage, and so the vagina was plugged and tight binder applied. When this was completed the patient was very collapsed, though she came from under the anæsthetic well, and spoke a little. She rapidly collapsed, and died before transfusion could be carried out. The plugs were removed from the vagina when the collapse occurred thinking there might be some vaginal tear, but there was absolutely none, and the amount of external bleeding was not more than 4 or 5 ozs.

INTERESTING CASES IN THE EXTERN MATERNITY.

Case I.—M. W., aged twenty-eight, 1-para; delivered of a female child alive on August 24th. Just as head came to vulva patient had an eclamptic fit, and two more followed before delivery was complete. Patient was in bad health during pregnancy. After delivery patient had seven fits within eighteen hours. She was treated by morphin, and sweated by means of hot bottles and blankets; also hot stupes over abdomen and region of kidneys. She passed no urine, and only 1 oz. came away with catheter during the labour. After the stuping the kidneys began to act, and patient slept after the sweating. No more fits occurred after eighteen hours, and patient recovered. There was morbidity for seven days and rapid pulse (110–125). The temperature became normal on eighth day. The uterus was curetted and douched during the puerperium.

Case II.—J. C., delivered on September 26th of a living child; twenty-four hours later patient developed eclamptic fits, and had 15 altogether; she was comatose for fifty-one hours; very œdematous about the face and both legs. The pulse was never more than 105; temperature up to 100°. She made a good recovery.

Case III.—B. O'N., 1-para, was in hospital for ten days owing to eclampsia; she had several fits during this time. Albuminuria and œdema of the extremities and face. The child was evidently dead, and the period of pregnancy seventh month. The eclampsia passed off, and the œdema disappeared on low diet and confinement to bed. Patient left hospital, and was confined a month later in the Extern Maternity of a macerated fœtus. There was no return of the albuminuria or the œdema at this time. Patient was quite well on the eighth day.

Case IV.—E. H., 1-para; delivered of a living child on October 26th. On fifth day—temperature 103.6°, pulse 120—the uterus was douched and explored; a mass of firm blood-clot was found adherent to lower uterine segment and removed; the uterus was then curetted and douched and packed with iodoform gauze. The temperature and pulse remained high; douching was done daily. On fifteenth day patient had a rigor; pulse

150, temperature 104.2°; douched, and gauze packing again done. Next day a small hæmatoma of posterior vaginal wall was found. The same condition of pulse and temperature continued for three weeks, when phlegmasia alba dolens developed. This subsided in four days, and the pulse and temperature became normal. Patient discharged well.

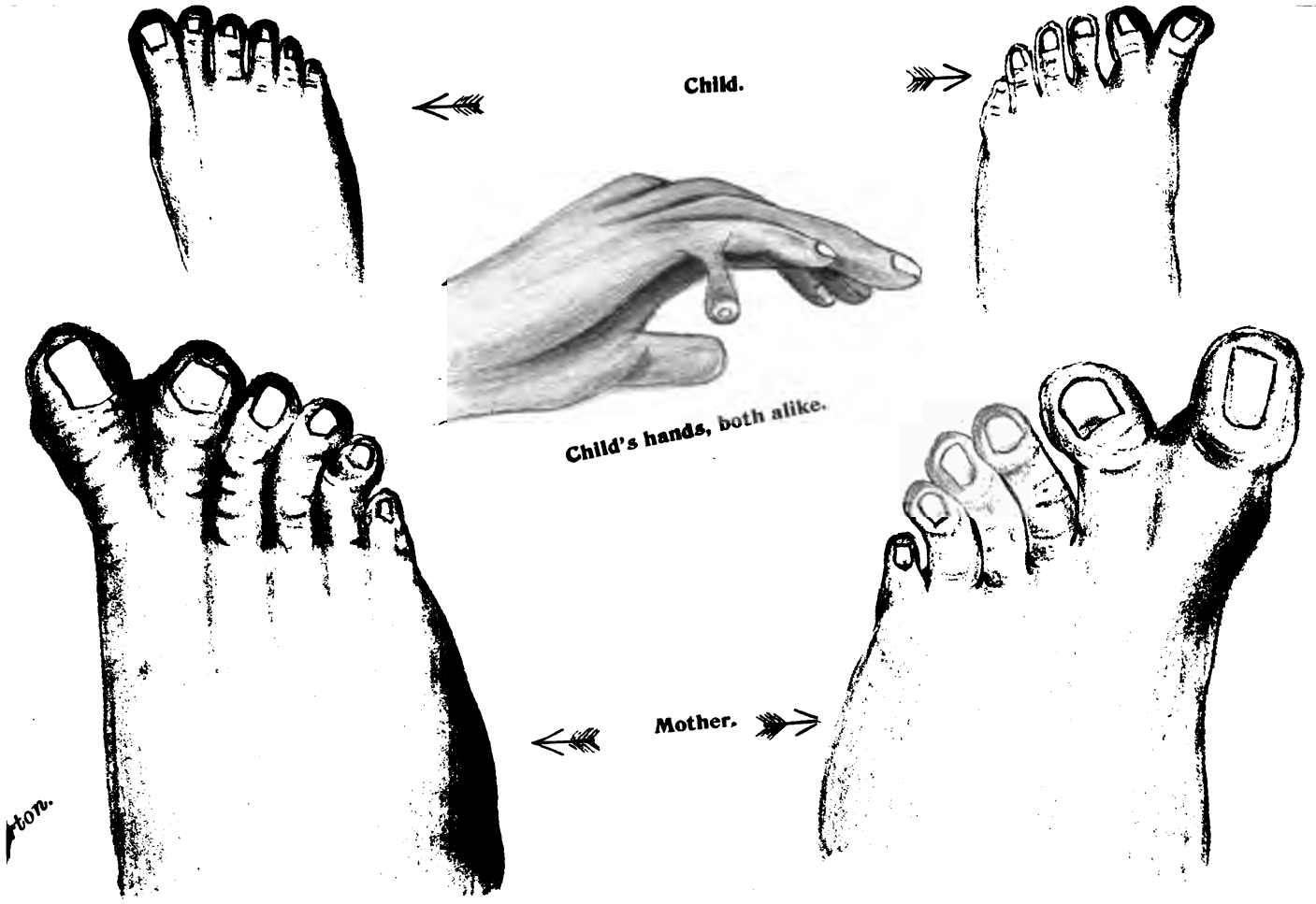
CASE V.—B. F., aged thirty, 6-para; delivered October 31st. The child was presenting with the arm prolapsed, the head oblique in iliac fossa. The cord was prolapsed and had ceased to pulsate: therefore delivery was effected by decapitation.

CASE VI.—M. G., aged forty, 13-para; delivered on October 26th of triplets. All were vertex presentations; the third, occipito-posterior. The three children were alive and well when patient was seen on tenth day.

CASE VII.—Mrs. R., aged forty-one, 12-para. Patient considered herself three months pregnant. She had profuse bleeding on December 19th, which ceased; recurred slightly on December 29th, and again ceased. On December 30th patient sent to hospital on account of profuse watery discharge, which had occurred some hours previously. When seen there was very little bloody discharge; the fundus was tender and two inches below umbilicus. The cervix was patulous at external os; the internal was closed. Hæmorrhage being inconsiderable, and the pulse and temperature normal, the only treatment adopted was rest and quiet in bed. On January 2nd hæmorrhage again occurred slight, so the vagina was tamponed. Next day patient complained of pain and vomited. The plugs were removed, and the os admitted a finger; then it was found that the uterus contained a hydatidiform mole. This was broken up with curette and removed; there was very little bleeding, and after douching none, so the uterus was not plugged. Three days later bleeding occurred, so the uterus was again douched and then curetted; very little removed. Patient well on fourteenth day.

CASE VIII.—H. M., aged twenty-two, 2-para. Patient considered herself six months pregnant. She had sanious discharge for a month before being seen. When first seen the uterus was half-way to umbilicus; pain above symphysis complained of. The os was patulous, admitted two fingers, and the vagina was found to contain characteristic parts of a hydatidiform mole.

Intra-uterine amputation of Left Arm above Elbow.


Child.
Child's hands, both alike.
Mother.

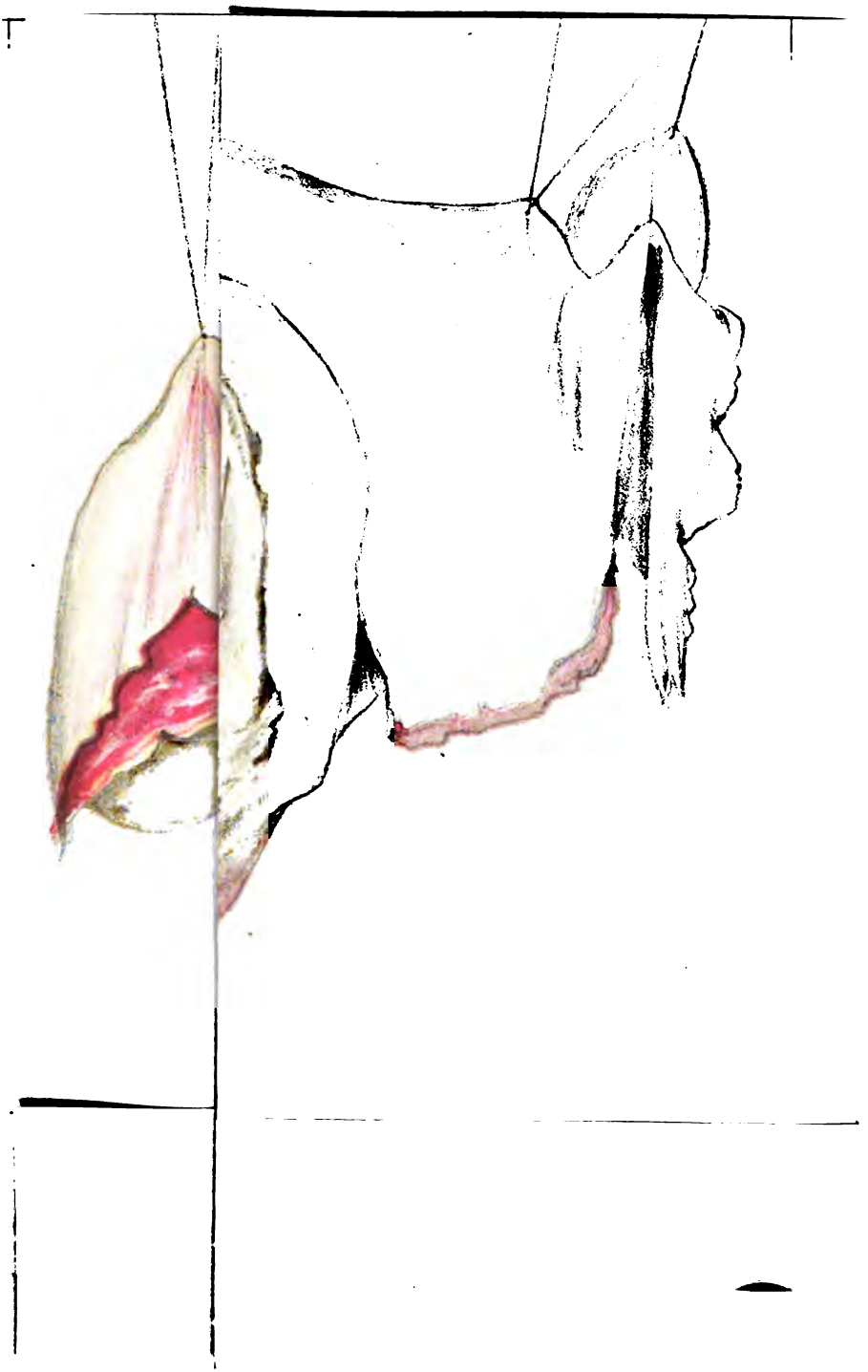


TABLE No. IV.—*Accidental Hæmorrhage Cases in Extern Maternity.*

Name	Age	Date	Para	Variety	Treatment	Result to Child	Remarks
S. B.	29	Dec. 4	4	Ext.	Plugged and tight binder	Dead	6 months pregnant.
J. F.	26	April 26	2	,,	Foot brought down	,,	Breech presenting; 6 months pregnant; in labour.
M. R.	26	May 2	2	Mixed	Plugged and tight binder	,,	Labour followed in 10 hours; clots with child.
K. W.	19	May 4	1	Ext.	,,	Alive	Labour in 2 hours; forceps delivery.
M. B.	28	May 8	1	,,	None	Dead	Macerated; labour not commenced.
M. B.	—	May 9	3	,,	Plugged and tight binder	,,	7½ months; labour in 2 hours.
H. H.	43	July 14	3	Int.	,,	,,	Labour in 4 hours; plugs expelled with child.
M. C.	49	July 11	19	Mixed	,,	,,	Labour in 24 hours; membranes ruptured; patient delivered herself; 2 quarts of old blood clots, with macerated child.
M. K.	—	Sept. 5	13	Ext.	,,	,,	Labour soon after; breech presentation.
M. B.	—	Sept. 7	11	Mixed	,,	Alive	Plugs removed in 18 hours and replaced; labour followed in 5 hours more; some old clots with child.
— L.	34	Sept. 8	1	Ext	Foot brought down	Dead	Macerated child; foot and arm presenting; patient in labour.
J. F.	—	Sept. 16	—	,,	Plugged and tight binder	,,	8 months; macerated; plugs expelled with child in 12 hours.
E. W.	36	Sept. 19	9	Mixed	,,	,,	Labour in a few hours; clots with child.
K. F.	36	Sept. 28	13	Ext.	,,	Alive	Plugs removed in 18 hours; no more bleeding; patient delivered herself 2 days later.
— Q.	—	Oct. 12	7	,,	Version	..	In labour; also prolapse of cord.
E. D.	—	Oct. 28	6	,,	None	..	In labour.
M. D.	37	Oct. 28	11	Mixed	Plugged and tight binder	,,	Patient very collapsed; was plugged, but died before delivery could be effected.

In eleven out of a total of seventeen cases the vaginal tampon was used.

The uterus was also filled with this. The pulse was rapid, and temperature 103.6°. The uterus was emptied with two fingers passed in, and when all was removed the walls were lightly curetted with a blunt curette. Hæmorrhage was very profuse during the emptying of the uterus and was difficult to stop, but was controlled by hot douching. The patient made a good recovery, and was convalescent on the fourteenth day.

TABLE No. V.—*Showing Number and Nature of Cases Treated in the Intern Maternity.*

Total number of cases	1,694		Multiple pregnancy—Twins, viz.:—		
Primiparæ	576		Female	10	
Abortions	64		Male	8	
Deformed pelvis	10		Mixed	3	
Eclampsia	7				21
Epilepsy	3		Myoma uteri		17
Erythema	25		Aphonia		3
Œdema vulvæ	4		Puerperal ulcer		2
Uræmia	1		Rupture of uterus		2
			Phlebitis		4
Hæmorrhage, viz.:—			Operations, viz.:—		
Accidental	13		Cæsarean section		1
Unavoidable	7		Forceps		60
Post-partum	28		Induced abortion		4
Secondary	1		Induced labour		8
			Manual removal of placenta		24
Hæmatoma	2		Perforation		3
			Version		8
Hydramnios	10		Diseased infantile conditions, viz:—		
			Anencephalus		1
Morbidity	146		Cephalhæmatoma		7
			Hydrocephalus		2
			Ophthalmia		2
Mortality, infantile—			Spina bifida		1
Macerated	32		Hare-lip and cleft palate		3
Premature	11		Supernumerary fingers and toes		1
Putrid	1				
Recent	34		Abnormal Presentations—		
			Breech and Footling		47
Died in Hospital	33		Brow		2
			Face		3
Mortality, maternal	9		Occipito-posterior		14
			Transverse		2
Mania	4		Prolapse of funis		9
			Compound		2

INDUCED ABORTION.

Case I.—H. T., 9-para, aged thirty-five; admitted March 7th; four and a half months pregnant. A watery, brownish discharge had been present for some time, so tents were placed in cervix, tampon in the vagina, and a tight binder applied. On the next day these were removed, and the uterus emptied with the aid of Schultze's spoon forceps.

Case II.—M. V., 5-para, aged twenty-six; admitted February 23rd suffering from ascites and the usual prodromata of eclampsia; pulse 120; six months pregnant. A vapour bath was given, one bougie passed into the uterus, eight tents in cervix, and tampon in vagina. Pains set in soon after, and in about eleven hours the vagina was emptied, and the uterus expelled its contents.

Case III.—M. S., aged twenty-six, 7-para; admitted February 11th; five months pregnant. Threatenings of miscarriage had been present for several days, and the os was patulous. Some hours later bleeding came on and a vaginal tampon was inserted, and on the next day it was found possible to empty the uterus.

Case IV.—M. M'D., aged thirty-three, 10-para; admitted February 11th; hæmorrhage had been going on for some time; pregnancy somewhat over three months. Tents and vaginal tampon were used, and later on dilatation was aided by Bossi's dilator, and the uterus emptied.

TABLE No. VI.—*Application of Forceps.*

Indication	No.	Dead Children	REMARKS
Delay in 2nd stage, with danger to mother and threatened death of fœtus - -	48	—	
Threatened rupture of uterus - -	2	—	
Prolapse of funis -	2	—	
Pelvic contraction -	1	—	
Hæmorrhage - -	2	—	
Persistent occipito-posterior - - -	3	—	
Rupture of vagina -	1	—	
Eclampsia - -	1	—	
Total, - -	60	—	

SUB-TABLE A.—*Showing No. of Pregnancy.*

I.-para - - -	45
II.-para - - - -	7
III.-para - - - -	3
IV.-para - - - -	2
V.-X.-para - - - -	3
Total -	60

SUB-TABLE B.—*Showing Ages of Forceps Cases.*

17-25 - -	20
26-30 - -	18
31-35 - -	14
36-40 - -	8

In many of the cases included under the heading "Delay in Second Stage with Danger to Mother or Child" we had reason to believe the second stage had been prolonged considerably beyond the customary time limit of four hours. We have always been of opinion that there are other and more important indications as to the proper time for terminating the labour artificially. In the case of E. G., 5-para, very troublesome vomiting was present for forty-eight hours before delivery. In three cases rotation took place to such a degree that the forceps was taken off and reapplied. In the case of E. C., aged twenty-eight, 5-para, there was anterior fontanelle presentation, and the shoulders were born in the transverse. In the case of A. B., 3-para, the funis was twice round neck, and so tight that it was tied and cut. Child was born alive. In two instances the hand came down in front of shoulders, and in one the hand was felt lying beside head and was pushed up before forceps was applied. In the case of M. N., 10-para, the fœtal heart could not be heard before delivery, though the child was born alive. In seven cases there was *post-partum* hæmorrhage, and manual removal of the placenta was required in three instances. In six cases the child was dead when delivery was effected.

In the Case of K. M., 1-para, aged thirty, much delay occurred owing to early rupture of membranes. Extraction with forceps was easy (the child weighing only 5½ lbs.), and was deemed advisable owing to rise of temperature and escape of the meconium. On the third day, the temperature having again risen, exploration of the vagina disclosed numerous thread-like adhesions between cervix and vaginal walls, some tears in the latter and in the cervix, and offensive discharge. Thorough cleansing of the affected parts and the insertion of iodoform gauze for a few days in succession secured a perfect convalescence on the tenth day.

The history, progress, and treatment of rigid os are well exemplified in the two following cases.

Case I.—R. B., aged thirty-six, 1-para; admitted August 14th; palpation disclosed a tense, unyielding condition of the uterus; a prominent tense condition of the round ligaments; pain and tenderness to pressure over the fundus. Fœtal heart very feeble, and varying from 70 to 120 beats per minute; os = size of a shilling, with hard, thin edges; membranes ruptured; ¼ gr. morphin was given.

August 15th.—Hip bath and morphin ¼ gr.; dilatation taking place slowly.

August 16th.—Hip bath, hot vaginal douche and morphin; os larger. Fœtal heart inaudible.

August 17th.—Os much larger, tightly stretched over head; anterior lip impacted and swollen. Forceps passed inside cervix, and gentle traction exercised, combined with digital pressure upwards on the anterior and posterior lips; when dilatation was nearly completed, perforation was performed (without removing the forceps), and the head delivered. Shoulders impacted; the delivery greatly aided by inserting blunt hook in axilla. Convalescence quite normal.

Case II.—M. A. M., aged thirty, 1-para; admitted October 1st; membranes already ruptured. Os patulous, and very little labour for some days.

October 6th.—Patient complains of abdominal pain, so a hip bath and vaginal douche were given in the morning, the os being then the size of a crown piece; vaginal douche repeated at 5 p.m. At 8 30 no further dilatation observable; some dirty vaginal discharge is present; the uterus is tense; the pulse 140. Morphin given and repeated in six hours, and sleep procured.

October 7th, 12 30 o'clock.—Forceps passed inside partially dilated cervix, and gentle traction used; but as the advance was very slow perforation was performed as in preceding case, and the delivery of the shoulders much aided by a blunt hook placed in axilla. Convalescence normal.

In a few cases where a rigid perineum appeared to be one of the causes of delay, extraction was much facilitated by opisiotomy. In three cases the uterus was deformed by fibroids, to the presence of which, very probably, inefficient pains were due.

Table No. VII.—*Uterine Fibroids.*

Name	Date	Age	Para	Presentation	Duration of Pregnancy	Child	Remarks
C. M.	Aug. 5	33	VI.	Vertex	Term	A.	Small fibroid on anterior wall of uterus.
A. G.	Aug. 5	35	I.	,,	,,	D.	Forceps. Two small fibroids in front.
B.M'H.	June 23	40	II.	,,	,,	A.	Fibroid posteriorly, p.-p. hæmorrhage.
M.M'D	April 4	34	I.	,,	,,	,,	Fibroid at right cornu
H. B.	April 3	35	IV.	Abortion	—	—	Was in hospital with fibroid uterus two years ago, not much increase in size since.
K. C.	April 3	20	I.	Vertex	Term	A.	Fibroid at each uterine cornu, smart p.-p. h.
M.J.S.	Jan. 3	42	I.	,,	,,	,,	Forceps. Large fibroid on left side.
J.M.C.	Nov. 16	38	IV.	,,	8 months	,,	Fibroid at left cornu.
E.M'D.	Sept. 2	30	I.	,,	Term	,,	Pedunculated fibroid at fundus.
C. M.	Sept. 17	30	II.	,,	,,	,,	Several small fibroids at fundus.
R. D.	Oct. 21	27	I.	,,	,,	,,	Fibroid on anterior wall.
B. D.	Sept. 8	31	I.	,,	,,	,,	Forceps.
— W.	—	29	I.	,,	,,	D.	Large fibroid in lower uterine segment; hysterectomy.
M. R.	Jan. 1	37	I.	,,	,,	A.	Forceps.
A. M.	Oct. 7	30	I.	,,	,,	D.	Forceps. Fibroid on anterior wall.
E. B.	Jan. 4	38	XII.	,,	,,	A.	Some p.-p. hæmorrhage
N. M.	Dec. 26	32	II.	Breech	,,	,,	Both feet brought down

Seventeen cases in all.

In only two of the 17 cases in this table was the tumour of considerable size; in one of these, though it probably weakened the contractile energy of the uterus, no obstruction to the presenting part took place. In the other the growth encroached so much on the area of expansion that I considered it necessary to amputate the uterus above the cervix. The patient, whose case is separately recorded, made an excellent

recovery, and the thinness of the uterine wall in the immediate vicinity of the fibroid shows how justifiable was the proceeding. It is interesting to note that in only three of our cases did *post-partum* hæmorrhage occur.

The diagnosis of pregnancy in a fibroid uterus is sometimes attended with much difficulty, as the following case will show:—

Many years ago a lady from the country consulted me with regard to a large uterine fibroid in anterior wall and fundus of uterus, reaching to the navel. She was forty-one years of age, twelve years married, in excellent health, and had never been pregnant. She did not suffer from pain or menorrhagia, but had recently missed a menstrual period. I advised her to continue without any special treatment; and similar advice was given her by an ex-Master of the Rotunda, who saw her at the same time. She returned to the country, and underwent electrical treatment at the hands of an enterprising local physician; and when vigorous and painful uterine contractions ensued after each treatment, she was comforted with the assurance that these were evidences of great improvement. One morning unusually severe pains set in, and in a couple of hours a healthy infant was born.

In former Reports will be found notes of cases in which each successive confinement was followed by steady diminution in the size of these tumours, while in others no such change was observed. In one case of great interest, pregnancy was attended with such rapid increase in the tumour that I deemed panhysterectomy advisable. A drawing of the uterus with a full account will be found in my Report for the year 1897–8. I think it is interesting to note, taking this table in connection with the similar ones in my former Reports, that—

I.—More than 90 per cent. of the patients affected with fibroids were considerably under forty years of age.

II.—In only a small proportion did *post-partum* hæmorrhage occur.

* Fibroid.

Missed labour in Fibroid Uterus. See Case.

III.—In a small proportion diminution in size of tumours followed or attended pregnancy.

IV.—In a still smaller proportion increased size of the tumours was observed.

The comparative youth of many of our Maternity patients affected with fibroids is, I think, a very interesting fact in connection with the origin and growth of these tumours, and affords some ground for the belief that pregnancy favours their development.

MISSED LABOUR IN A CASE OF FIBROID UTERUS; SUPRAVAGINAL AMPUTATION; RECOVERY.

K. W., aged twenty-nine, 1-para; admitted February 12th. About five weeks previously, when, according to her own reckoning, she had reached full term, fœtal movements ceased, and a few days subsequently the breasts became swollen and painful. This sign of the death of the fœtus *in utero* I regard as of much significance, though it is not mentioned in any of our text-books. On examination some sanious uterine discharge was observed; the os was dilated enough to admit one finger, but no presenting part could be reached. Ten laminaria tents were passed into cervix, and a tampon placed in vagina. When they were removed, some hours later, I was able to detect a somewhat flattened fibroid, lying chiefly to the left side, and encroaching on internal os for about one-third of its circumference, as well as half filling pelvic brim. The head could be reached at a considerable height, its descent being plainly prevented by the tumour—an interstitial myoma. The cervical canal was of unusual length, considerably deflected to the right; and the uterus was tightly moulded round the fœtus, and liquor entirely absent. At no time since her admission had the patient felt any labour pains. Having regard to all the conditions present, I determined to remove the uterus, and carried out the proceeding in the usual manner, providing ample peritoneal flaps to cover the cervical stump. Recovery was entirely satisfactory.

The rarity of cases of "missed labour" may be judged from the scanty notices of them in medical literature, and

this is the only instance which has come under my own observation.

I desire to direct special attention to the condition of the internal uterine surface in this case, as shown in the illustration. There is no trace of the projection commonly spoken of as Bandl's ring.

CÆSAREAN SECTION.

M. R., aged twenty-four; admitted to hospital in miserable health. She had been in labour for some hours, and the head was still free above the pelvic brim. Cæsarean section was performed the day after her admission. For a few days her pulse was very rapid, but apart from this convalescence was uneventful. The child was in very good health at time of leaving hospital.

CONVULSIONS.

During the year twelve patients suffered from convulsions. Of these, three were ordinary epileptic seizures, and in the remaining instances puerperal eclampsia was diagnosticated.

CASE I.—C. M., aged twenty-two, 1-para; had been in labour several hours, the breech presenting, when an epileptic fit of the ordinary type occurred, and made it expedient to hasten delivery, which, accordingly, was effected, and a living child extracted. A small dose of morphin was given, and there was no recurrence.

CASE II.—S. D., aged twenty-three, 1-para; had an epileptic fit a few minutes after delivery; no recurrence.

CASE III.—M. C., 1-para; delivered on October 4th at full term; had an epileptic fit of the ordinary type on the 7th; no recurrence.

ECLAMPSIA.

The cases of eclampsia were as follow:—

CASE I.—C. D., aged twenty-eight, 2-para; admitted on the 11th and delivered on the 13th of August, in the eighth month. She had been in bed for some days suffering from pain in back and head, constipation and sickness. No fœtal movements for three weeks. Some hours after a convulsion she was admitted

to hospital, the limbs being much swollen, and the urine highly albuminous. Morphin (¼ grain) was administered, and a vapour bath for thirty minutes. No more fits occurred, and on the following day patient delivered herself of a stillborn child. On the following day two more fits occurred, after which the patient became somewhat hysterical, but relief and improvement again followed the injection of morphin, and the subsequent course of the puerperium was satisfactory.

Case II.—E. E., aged twenty-seven, 2-para; admitted May 4th, in an unconscious state, with a history of having had several fits. Her pulse was then 96, but soon rose to 110, and the temperature to 100°. The fits increased in frequency, the interval sometimes being only a few minutes; the increase in their duration was more remarkable, some of them lasting from ten to twenty minutes, though not violent in character. The injection of morphin and other measures used had no beneficial effect, and the patient expired about fifteen hours after admission to hospital, the temperature rising to 110° just before death. The size of the uterus was that of a six and a half months' pregnancy, and the urine was highly albuminous.

Case III.—A. F., 1-para; admitted February 4th; eight months pregnant; unconscious, and suffering from frequent fits, which had begun at 4 a.m., and at time of her admission were coming at intervals of seven and eight minutes. There was apparent improvement after injection of morphin, as an interval of one hour and twenty minutes occurred, followed by two at intervals of half an hour. I then thought it wise to try the effect of bleeding, and one pint of blood was allowed to flow, followed by the transfusion of two pints of saline solution. An hour after this was done one fit occurred, at six o'clock p.m. Digitalin ($\frac{1}{50}$ gr.) was given, and the patient's aspect improved. At seven o'clock another fit, shorter and less severe than any that preceded it, but our efforts to re-establish respiration were unavailing, and after two short gasps she expired. We were informed that she had been subject to epileptic attacks from childhood, and that at the time of quickening a convulsion had occurred.

Case IV.—C. G., aged twenty-nine, 1-para; admitted September 11th. Two hours after an easy labour patient had a fit, and

during the succeeding twelve hours two more. The urine was very albuminous. Morphin (¼ gr.) was given twice, followed by aperient medicine, and a satisfactory convalescence ensued.

CASE V.—B. O'N., aged thirty-five; admitted September 11th. Previous to admission patient had eight fits, and morphin (½ gr.) had been given. She was at time of reception into hospital comatose. A vapour bath was immediately given, but the skin did not act well. Croton oil and turpentine enemata were administered. Urine nearly solid with albumen. A long sleep followed, without any return of convulsions; the bowels were freely moved; the quantity of albumen present in urine speedily grew less, and she left the hospital soon after. She has since been safely delivered in the Extern Maternity.

CASE VI.—B. F., aged nineteen, 1-para. Patient was suffering from œdema of face and legs when admitted, but did not complain of anything. When the head was visible at the vulva an eclamptic fit occurred, so chloroform was speedily administered and labour completed. Some hours later a second fit occurred; patient was given a vapour bath, and convalescence was soon established. The urine was loaded with albumen.

CASE VII.—K. S., aged thirty-seven, 7-para; admitted on October 6th suffering from much swelling of face and limbs and highly albuminous urine. Two days later a great headache was complained of and relieved by vapour bath. On the next day a fit occurred. Morphin was given, and another vapour bath, which again relieved, and was followed by increase in the amount of urine. She continued in somewhat the same condition for a few days, when labour set in. She was safely delivered of a macerated fœtus, and made a good recovery.

CASE VIII.—J. D., aged twenty-eight, 5-para; was seen in the Extern Maternity, and was reported to have had two fits. She gives a history of several fainting fits in a former pregnancy. The patient's aspect was bad, the limbs were swollen, and there was a large quantity of albumen in the urine. The usual precautionary treatment was adopted, and she was delivered of a dead child on the day following her admission.

CASE IX.—In the case of M. F., aged thirty, 2-para, the fits were somewhat anomalous in character and in their sequelæ.

Patient passed through an easy labour on March 24th, but had a rise of temperature on third day, for which a uterine douche was given. On March 29th patient had a fit, accompanied by involuntary escape of urine, and subsequently the right side of the body showed clonic movements. She regained consciousness, but talked wildly and incoherently, and tossed herself about very much. In three hours later there was another fit having very much the character of an eclamptic seizure. When coma had passed off, the right side again showed inco-ordinate movements. Hyoscin hydrobromide was given, and sleep and rest secured, followed by a normal convalescence. The urine contained pus and granular casts.

URÆMIA.

To the foregoing I desire to add the record of a case in which I believe uræmia was the cause of death, though the general aspect and condition of the patient suggest an affinity with those just recorded:—

M. O., aged thirty, 5-para; six months pregnant; had been complaining during the day (May 30th) of headache and vomiting, and about 9 30 p.m., without any convulsion, she became suddenly unconscious, and did not subsequently recover from this condition. About one hour later she was admitted to hospital in a moribund condition, respiration so failing as to need frequent stimulation, and aspect very bad. A vapour bath was tried, but sweating did not follow its use. Faradic stimulation was also tried, and then I allowed about fourteen ounces of blood to flow from her arm, and then practised transfusion of saline solution. Death followed soon after. The pulse all through remained below 100, and at first was full and of good volume; temperature remained normal. She had been pregnant five times, and in the four preceding pregnancies had aborted at the third month. Though no œdema was observable the urine was loaded with albumen.

I have mentioned these cases somewhat in detail, as I believe their importance warrants, and because there is no obstetrical complication regarding which so much has been

written and so many theories propounded. Though venesection did not benefit the cases here recorded, I think it a measure worthy of more general adoption and practice, as it is not contra-indicated by any theory; and in the last century, when for a long period it was the almost invariable practice (chloroform and morphin being still unknown), recovery, even in severe cases, was by no means infrequent. Ample evidence of this I have found on reading over records preserved by former Masters of the Rotunda. The importance of hastening and facilitating the emptying of the uterus in these cases can scarcely be over-estimated. I am not yet convinced of the wisdom of trying to secure this object by indiscriminate forcible dilatation of the cervix.

During the earlier years of my Mastership the treatment by morphin secured such good results that our mortality was about 7 or 8 per cent. Our diminished success in later years is, I believe, mainly due to the greater severity of the cases.

MANIA.

Four patients became affected with mania; in three it was of a mild type, and in one it was associated with paraplegia.

CASE I.—M. M., aged thirty-seven, 1-para; passed through a short labour, lasting only eleven hours, but was quite maniacal for a short time before and during the passage of the head over the perineum. No recurrence subsequently.

CASE II.—N. L., aged twenty-nine, 1-para; delivered naturally of a very small child after a short labour attended with some bleeding during the second and third stages. Placenta required manual removal. On the third day (pulse and temperature both normal) she became noisy and troublesome, and refused food. However, with some persuasion the food was taken, also some medicine, and in four days she was quite right again.

CASE III.—S. H., aged twenty-four, 4-para; went through an easy labour safely. Five days afterwards she became sleep-

less, affected with delusions and loss of sleep; refused food. Morphin was given, also hyoscin, with some benefit, and soon after leaving hospital she became quite well.

Case IV.—M. R., aged twenty-four, 1-para; unmarried. Patient complains of loss of power in both legs, which came on gradually, with an attack of retching, three days before admission. April 26th.—She is quite unable to stand. Abdominal palpation proved to be useless owing to rigidity of muscles. April 28th.—There is incontinence of urine and fæces, and patient states she is unable to move her legs. The plantar reflex is very badly marked in both feet; the patellar reflex is well marked, and there is sensation in both legs. No ankle clonus observable. April 29th.—Patient has occasional vomiting, and can retain food only in small quantities. April 30th.—Labour has started to-day, and the pains which were very feeble before rupture of the membranes soon after increased, and in less than two hours afterwards child and placenta were born without any trouble. The rigidity of abdominal walls before observed continued after conclusion of labour. May 1st.—No improvement in motor power. Patient complains of lancinating pains in both legs; the left plantar reflex is a little more marked, but not the right; wasting of muscles is observable. May 3rd.—Patient has a marked elevation of temperature in the evening without obvious cause. There is still incontinence of urine. May 5th.—During the night or early morning patient has had a violent hysterical attack, being very noisy and abusive in language. She has also had an hysterical fit, with muscular spasms in face and one arm, but not losing conjunctival reflex. Morphin and bromide were given. May 6th.—Patient was quiet during the night, but in the morning had another noisy fit, lasting two hours, after which she became quiet and rational. The catheter is passed twice daily and no dribbling of urine occurs. May 7th.—Refused food during early part of day, but took it in the evening. May 8th.—Has been quite insane all day; is very obstinate and refuses food; has been singing and incessantly throwing her hands about. May 15th.—Remains in much the same condition; sometimes noisy and troublesome, and sometimes refusing food; transferred to North Dublin Union.

TABLE No. VIII.—*Prolapse of Funis.*

Name	Age	Para	Date	Period of Pregnancy	Result to Child	Presentation	REMARKS.
E. C.	30	III.	July 9	Full	D.	Vertex	Forceps
M. W.	25	V.	June 5	,,	A.	,,	Version; reposition, in genu-pectoral position, tried without success
E. D.	25	I.	,, 18	,,	A.	,,	Expression
M. M.	42	IX.	Apl. 26	,,	D.	,,	Version
A. F.	22	I.	Feb. 2	,,	A.	,,	High forceps
S. L.	34	XIII.	Jan. 26	6½ months	D.	Hand & head	——
E. D.	32	VII.	,, 2	,,	A.	Hand and vertex	Replacement, recurrence, expression
M. D.	30	I.	Dec. 16	7 months	D.	Breech	Anencephalic fœtus and hydramnios.
N. M'C.	32	II.	,, 26	Full	A.	,,	Both feet brought down
M. C.	24	I.	Sept. 6	,,	D.	Vertex	Bipolar podalic version

Ten cases in all.

Prolapse of funis being a complication of labour fraught with peril to the fœtus, the results of our treatment, as shown in the accompanying table, may be regarded as satisfactory.

In the cases of S. L. and M. D. the birth of a living child was not to be expected.

In the case of E. C. the head was on the perineum when the prolapse was discovered, and in the genu-pectoral position reposition of funis was effected and forceps afterwards applied. The heart was still beating at time of birth, but respiration could not be established.

In the case of M. W. prolapse immediately followed rupture

of the membranes, and when reposition was tried without success rapid delivery by version was effected.

In the case of A. F., 1-para, a large loop of cord was found protruding from the vulva at time of admission, the head being still at brim. The os being fully dilated, the forceps was applied, rotation taking place during extraction, and a living child was born.

S. L., in her 13th pregnancy at thirty-four years of age, was admitted in the 7th month, a loop of funis, pulseless, protruding beyond the vulva, while the head and one hand could be felt just inside os. The patient was put under chloroform, and Bossi's dilator passed into cervix and expanded to 10°. At this point the head easily fitted between the blades, which, by a reverse movement, were made to grasp and extract it.

M. D., 1-para, was admitted suffering much pain from hydramnios. When some pints of liquor amnii had escaped a loop of funis was found prolapsed and pulseless; labour was expedited by pressure. The child was anencephalic and affected with spina bifida.

In the case of E. D., 7-para, head, hand and cord were presenting. Membranes ruptured during examination. The hand was easily pushed up, but the cord became prolapsed, and, after an attempt to replace it, pulsation ceased. The head was then pushed up and pulsation again became perceptible, and an attempt to push the cord over brow of child was successful. As the head descended, however, another prolapse of cord occurred, but by vigorous pressure on fundus labour was completed and child easily resuscitated.

In the case of E. D., aged twenty-five, 1-para, as the head appeared on the perineum, a loop of the funis appeared in front of it. Pressure was made on the fundus, and the head delivered quickly, child being alive.

TABLE No. IX.—*Cases of Contracted Pelvis.*

Name	Age	Para	Pelvic Measurements					Mode of Delivery	Result to Child	Remarks
			C. V.	Trans.	Ext. C.	I.-C.	I.-S.			
E. F.	38	II.	8.5	10.5	—	—	—	Natural	Alive	In 8th month ; labour induced.
E. B.	37	IV.[a]	—	—	—	—	—	Natural	Alive	Labour induced.
M. K.	40	XIV[a]	—	—	—	—	—	Natural	Alive	(7th time) Labour induced.
M. C.	39	XIV[a]	—	—	—	—	—	Version	Alive	Labour induced.
M. R.	29	II.	7.25	10	—	—	—	Forceps	Dead	Labour induced.
M. Q.	26	II.	—	6.75	15.5	25	20.5	Natural	Alive	Labour induced.
T. C.	30	V.	—	—	16.5	28	25	Natural	Alive	Labour induced.
M. M.	30	VI	9.6	10.5	17.5	27	24	Natural	Alive	Labour induced.
M. C.	24	I.	7	—	—	—	—	Version	Dead	Funis prolapsed.

[a] *See* former Report.

CONTRACTED PELVIS.

Amongst the forceps cases were three, in which, from difficulty in delivery, some pelvic contraction seemed highly probable; in two of these narrowing of the pubic arch was observed. Attention may be directed to the two cases, M. K. and M. C., aged respectively thirty-nine and forty, both in their 14th pregnancy, and both of whom have gone safely through induced premature labour on seven occasions, a living child being secured in nearly every instance. In several of these cases I tried to start uterine action by placing tents in cervical canal and a tampon in vagina, and sometimes a tampon of gauze in cervix, but subsequently I found it necessary to pass bougies into the uterus.

Their action was supplemented by 5-gr. doses of quinine; and on many occasions by the application of the interrupted current, which seldom failed to cause pains, though not always permanent in character.

The case of M. R., aged twenty-nine, 2-para, illustrates forcibly the difficulties and uncertainty which often attend our efforts in such cases. Her first delivery was effected by forceps, and the child was stillborn. When she had reached the eighth month in the second pregnancy, on April 8th, two bougies were passed into the uterus and ten laminaria tents into the cervical canal, the vagina at the same time being lightly tamponed. In about twelve hours pains set in, and were stimulated with faradic current, and became fairly strong. Thirty hours after their introduction, tampon, tents and bougies were removed, and, as there was hydramnios, membranes were ruptured. April 10—os very imperfectly dilated. Sagittal suture can be felt close to pubis. At 11 o'clock p.m. same day, forceps was passed within cervix and traction used for half an hour, but very little descent of head or retraction of cervix was effected, and I thought it safer to desist. The next morning, April 11, the cervix was

entirely retracted and the head visible on separating the labia. Even then considerable traction was requisite to complete delivery. The fœtal heart was beating at time of birth, but respiration could not be established. A considerable experience in these cases has convinced me that no one stimulus to uterine action is entirely reliable; and this uncertainty as to the behaviour of the uterus constitutes at once the chief source of danger to mother and child and of our anxiety as to the issue of the case. As I have observed in a former Report, a patient who has gone through one successful proceeding of this kind has, for this reason, a favourable anticipation which greatly helps her under similar circumstances.

MULTIPLE PREGNANCY—TWINS.

Male and Female	3
Both Male	8
Both Female	10
Both Vertex	15
Vertex and Breech	3
Breech and Vertex	2
Both Breech	1

In one instance the first child presented occipito-posterior; the second, complete breech. One compound presentation was met with (head, cord and hand). As reposition failed, podalic version was performed; both children were born alive.

Persistent occipito-posterior presentation of first twin occurred in the case of F. T., 1-para, and owing to delay forceps was applied, the os being still imperfectly dilated.

In the case of B. S., primipara, aged twenty-seven, both children presented by the breech; but the first lay so obliquely at brim that it was necessary to bring down a foot; the second was spontaneously expelled, and both were alive. The second sac was hydramniotic.

In the case of B. R., 2-para, who was suffering from mitral

valve disease, some accidental hæmorrhage preceded the birth of the first child.

BREECH AND FOOTLING PRESENTATION.

During the year fifty cases of presentation of the lower pole occurred, in thirty-five of which a living child was born. Of the stillborn children, nine were macerated, six were lost owing to difficulty in delivery of the arms and head. Four were complicated by maternal hæmorrhage and eclampsia. Four of the macerated and three of the living children were delivered by natural efforts, without any assistance.

MANUAL REMOVAL OF PLACENTA.

This proceeding was found necessary in twenty-four instances. Seven of the patients were 1-paræ; six suffered from elevation of temperature subsequently, and of these one, I greatly regret to record, died of acute sepsis in two days. The history of the case is as follows:—

B. W., aged twenty-six, 1-para, was admitted on February 5th, and was delivered naturally after a labour lasting thirteen hours. When the third stage had lasted forty-five minutes, and on examination the os was found closed, two fingers were passed into the uterus, and the placenta was found to be firmly adherent to anterior wall; its removal was not attended with much loss. The patient had a swelling under the right arm in front, which ran into the axilla and down to the upper lateral margin of right breast. The swelling, though not red, was very painful. In the evening of February 6th aperient medicine was given as temperature was 103°. Some vomiting followed, but with the aid of morphin she slept, and on the morning of the 7th the temperature was 98°. She took nourishment during the day, but in the evening at 6 o'clock her temperature had fallen to 96.6°, and the pulse had become weak and rapid. At 10 o'clock p.m. she was cold and pulse imperceptible; complaining of pain in back and head; respiration 30; tongue clean; abdominal conditions normal. Strychnin was given hypodermically, followed by a transient improvement, but the patient presently became

restless, difficult to manage, and inclined to shout noisily. Later she got an injection of morphin with strychnin, which was followed by some rest. At 2 o'clock a.m. patient had a fit consisting of a distinct preliminary stage lasting about one minute, followed by tonic and clonic convulsions. A condition of coma ensued which lasted until death about one hour later.

While I cannot help regarding sepsis as the chief cause of the rapid and disastrous ending of this case, I confess myself unable to explain many of its details, for which I can find no parallel in my own experience.

One of the patients dealt with in this section required manual removal of the placenta in all her labours—five in number.

ACCIDENTAL HÆMORRHAGE.

During this year no case of severe accidental hæmorrhage came under treatment. But I desire once more to point to the results which we have obtained in this and in former years by the judicious use of the vaginal tampon, which controls bleeding, and in a few hours initiates uterine action, the absence of which forms the chief source of danger to the patient's life. This mode of treatment is not a new suggestion; it is fully described in Spiegelberg's admirable treatise on obstetrics, as well as the risk (which I believe to be greatly exaggerated) of internal bleeding following its adoption. But it is not too much to say that the teaching and practice of it as carried out in the Rotunda Hospital mark a very important epoch in the successful management of this most formidable complication of labour, and the results shown in our Reports furnish evidence in its favour which no intelligent obstetrician can afford to disregard.

TABLE No. X.—*Accidental Hæmorrhage.*

Name	Age and Para	Date	Variety	Treatment	Result to Child	REMARKS
1. M.J.G.	27, VI.	July 25, 1903	Mixed	Tampon	Dead	Local signs of bleeding before it became visible; more than 1 lb. of clot with placenta.
2. E. C.	30, IV.	May 4	External	—	Alive	Bleeding before admission. Delivered naturally.
3. R. M.	30, VI.	Mar. 5	Mixed	—	Dead	Delivered naturally.
4. K. K.	24, II.	,, 12	,,	Rupture of membranes	,,	Six months' pregnancy; temp. on admission 95.2° F.
5. E. F.	36, VI.	,, 26	,,	,,	,,	Uterus persistently tense, and fœtal parts impalpable some hours before delivery.
6. M. C.	30, VIII.	Feb. 1	,,	,,	,,	—
7. A. T.	26, IV.	Nov. 22	External	Forceps; rupture of membranes	,,	Head free above brim, so that lock of forceps was within vulva.
8. E. M'A.	33, I.	,, 27	,,	Forceps	Alive	Placenta degenerated.
9. E. M'D.	39, III.	Sep. 10	,,	Tampon	Dead	6½ months' pregnancy.
10. C. M.	28, VI.	,, 16	,,	,,	Alive	6½ months' pregnancy.
11. E. K.	29, IV.	Jan. 17	Mixed	—	,,	Fatty degeneration of placenta. Child syphilitic. Delivered naturally.
12. C. H.	26, V.	Nov. 26	Concealed	—	,,	Delivered naturally; large retro-placental clot.
13. B. R.	25, II.	Sept. 4	External	—	—	Twins; macerated; smart *ante-partum* bleeding.

POST-PARTUM HÆMORRHAGE.

We have to record nine cases of severe *post-partum* hæmorrhage, and amongst these I grieve to add one ended fatally—the only death from this cause which occurred during my Mastership:—

The patient E. M., aged twenty-one, 2-para, was admitted, apparently in good health, on February 16th, and labour was completed in about eleven hours unaided. The third stage was very short, only five minutes, and was followed by considerable bleeding, which ceased when some portions of membrane were removed by curette and hot douche. The uterus contracted feebly, and twice ergot was administered and the binder applied. About twenty minutes later there was some return of bleeding, and rapid collapse set in, to avert which injections of ether and strychnin, followed by saline transfusion, were unavailing, and death occurred about two and a half hours after delivery.

E. B., aged thirty-three, 8-para, was admitted on July 12th. Labour was unaided, though very slow, during the first stage especially, and attended with so much suprapubic pain that morphin was twice administered hypodermically. The third stage was of moderate duration and unattended with hæmorrhage. About two hours later considerable loss of blood occurred, and it continued after some clots had been expressed and good uterine contraction established. The vagina was explored, and a rent in the anterior vaginal fornix was found. A very hot uterine douche was administered and the vagina tamponed. The patient was very prostrate for some hours, but a very good convalescence, without pyrexia, followed.

Secondary hæmorrhage occurred on the fourteenth day after delivery in the case of M. H., aged twenty-six, 3-para, who had passed through a normal puerperium, and had left the hospital on the eighth day. When the bleeding occurred she was re-admitted, and, on examination, a sessile tumour, with broad base, was felt by the finger projecting from anterior uterine wall. A hot douche and light use of the curette were followed by rapid restoration to health.

Concealed *post-partum* hæmorrhage occurred two hours after delivery in the case of M. R., aged thirty-six, 5-para.

The third stage had lasted only eight minutes. The usual treatment was successfully used. In two instances marked retroversion occurred soon after delivery, attended with troublesome loss, which ceased when the uterus was douched and replaced. Marked hypertrophy and prolapse of cervix was observed in two cases, attended with moderate *post-partum* bleeding.

In the case of M. M., 1-para, aged twenty-two, troublesome bleeding occurred from a rent in the vestibule, where a spouting vessel was observed; it was controlled by passing a ligature under it.

Irregular contraction of the lower uterine segment, causing retention of placenta, was attended with considerable loss in two cases. In six cases calling for manual removal of the placenta some *post-partum* bleeding took place; and seven cases of forceps delivery were complicated with *post-partum* hæmorrhage. In many of these cases bimanual massage of the uterus proved to be of great use in restoring efficient contraction.

MORBIDITY.

Morbid temperature occurred in two cases of *post-partum* hæmorrhage, in five of manual removal of placenta, in two cases of abortion, in three breech cases, in two cases of fibroid uterus, in eleven forceps cases, and in four cases of *ante-partum* bleeding. Of the patients under the first heading—viz., 100.8°–101.2°—twenty showed one rise of temperature during an otherwise normal puerperium, and no treatment was adopted. In two there was a very protracted first stage, owing to rigid os. One was a case of accidental hæmorrhage, and the rise occurred only on 11th and 12th days; one was a case of delay with hæmorrhage in third stage, requiring manual removal of placenta. Highly albuminous urine was present, with œdema of abdominal walls in one case. In two cases the nipples were cracked and painful, and in another a

bruised unhealthy state of labia, attended with non-union of perineum, was present. In a few others a uterine douche was sufficient.

Between 101.2°–102.2° there were nineteen cases, in which one rise occurred, but there was no need for treatment. In fifteen the uterus was douched and curetted, generally with the result of removing some unhealthy contents. In one a macerated breech presentation had occurred; in one the vaginal wall presented a deep tear. In a case of placenta prævia influenza was the cause of temperature. In a case of hydramnios, with œdema of limbs and albuminous urine, the temperature ran up on the 14th, 15th and 16th days, and the uterus was drained with iodoform gauze.

Between 102.2° and 104° there were five cases in which one rise occurred and no treatment was needed. Two cases of *ante-partum* hæmorrhage were douched, curetted and drained with iodoform gauze. Two cases of forceps delivery were douched and curetted. In twenty-six cases, including one of breech presentation and two in which manual removal of placenta was necessary, douching and curetting were adopted, followed by speedy convalescence. In one case (elsewhere detailed) death occurred on the third day. One case had been delivered in the lift. Mastitis was present in four cases. In two others bronchitis and pneumonia respectively. In another fits of an anomalous character occurred between 4th and 10th days of the puerperium; the urine contained albumen, pus and blood.

Of the cases which reached 104° and over, two were cases of mastitis, one ending in suppuration; two were cases of decidual endometritis, in one case associated with acute pulmonary phthisis, which ended fatally in four weeks (patient unmarried). In one (see elsewhere) a rash closely resembling that of scarlatina developed on the fifth day, and was followed by desquamation and recovery. One patient who required

forceps delivery was much troubled with vomiting during and after labour, but made an excellent recovery. One patient who had suffered from concealed *post-partum* hæmorrhage developed a temperature of 104.5° on the 10th day, up to which time it had been normal; treatment was followed by rapid convalescence. In five cases a very high range of temperature was present for several days; in one of them very loaded bowels, and in another a labial abscess, helped to delay recovery, which, however, followed slowly in all of them. One other case (described in detail) was suffering from physometra and stinking uterine discharge at time of admission, and died on the 8th day.

Mastitis was present in one case on the 7th day. Puerperal ulcer was found in one case. One patient on 13th day and two following days had a rigor, with a swollen, painful state of breasts, and this has happened to her in every confinement. Beyond giving 5 grains of quinine nothing was done. Chronic phthisis was present in one case. Retained offensive lochial discharge caused one elevation in one instance. One elevation of temperature occurred after manual removal of placenta in a case where a macerated fœtus presented by the breech. Two elevations of temperature followed by speedy convalescence were due to retention of portions of placenta, giving rise to sapræmia and foul, profuse lochia; removal effected by curette and fingers. Five of the patients in this section were delivered by forceps, two of them being cases of persistent occipito-posterior; one a case of twins, in which the second twin was macerated; and one a case of fibroid uterus. In very few of the cases in this section did the abnormal temperature last more than 2–4 days.

CAUSES OF HIGH TEMPERATURE, OTHER THAN SEPSIS.

Mastitis	Bronchitis	Phthisis
Influenza	Pneumonia	Scarlatina (?)

TABLE No. XI.—*Morbidity.*

Temperature	Nov.	Dec.	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Total
100.8° to 101.2°	1	4	1	2	5	1	1	2	3	8	1	9	38
101.2° to 102.2°	6	3	5	4	2	3	5	5	4	9	5	4	55
102.2° to 104°	1	1	3	3	8	2	4	4	–	8	7	–	41
104°	1	1	2	–	2	–	–	1	1	1	2	1	12
Total per month -	9	9	11	9	17	6	10	12	8	26	15	14	146
Percentage per month	7.5	6.4	8.5	7.5	12.9	4.6	7.4	8.2	4.6	17.3	9.4	9.1	

TABLE No. XII.—*Placenta Prævia.*

Name	Age and Para	Date	Variety	Presentation	Period	Result to Child	REMARKS
1. M. G.	22, III.	Aug. 10	Marginalis	Head	Term	A.	Several bleedings during fortnight before admission; tampon used and vigorous labour pains followed.
2. L. H.	31, VIII.	July 16	Centralis	,,	,,	D.	No bleeding for some hours after admission; when os was wide enough to admit two fingers podalic version was performed.
3. C. L.	35, IX.	,, 2	,,	Breech	7 months	D.	Placenta required manual removal owing to hæmorrhage.
4. A. M'C.	32, VII.	May 2	Marginalis	Head	7 ,,	D.	Podalic version.
5. M. S.	32, V.	Feb. 4	Lateralis	Breech	Term	A.	Much difficulty in delivering head, as face was anterior.
6. M. W.	38, VII.	Sept. 2	Marginalis	,,	,,	A.	Tampon used and foot brought down.
7. A. H.	44, IX.	,, 24	—	Head	8 months	D.	Podalic version.

Cephalhæmatomata.

As in the two preceding years, our cases of placenta prævia during this year are free from any maternal fatality. The cases for the three years number 32.

ABORTION.

The cases of abortion and miscarriage were over 60 in number, and in two instances there was an insignificant rise of temperature. In eighteen cases no treatment was needed; in eight the bleeding was severe. Retroversion was observed in two cases; and in three a complete decidual cast was found. It is not a little surprising how uncertain and timid most modern obstetric writers are in giving instruction as to the treatment of inevitable and incomplete abortion and miscarriage. Masterly inactivity on the part of the physician cannot be too strongly condemned in these cases.

HYDRAMNIOS.

This condition was present in six cases. In one the fœtus was anencephalous, and affected also with spina bifida. In one spontaneous version occurred shortly after the escape of the liquor amnii. In Williams' recent work on obstetrics it is dogmatically stated that this interesting process can take place only before the rupture of the membranes.

ERYTHEMA, WITH HIGH TEMPERATURE.

B. B., aged twenty-one, had an easy, natural labour. On the third day the temperature reached 102°, and the pulse 108; the uterus was douched and curetted; nothing abnormal was found. On the fourth day the temperature was again normal. On the fifth evening the temperature was 103°, pulse 110; slight headache; uterine douche again revealed no cause for the symptoms. On the sixth morning the face was flushed, the eyelids somewhat red, and a scarlatiniform rash was evident on the legs, extending up the body, and visible over the sternal region; nausea, slight retching, and sore throat were complained of; though the lochial discharge had been all through healthy, another uterine douche was given as a precaution. Temperature varied between 105° and

103° for a few days, and became normal on the twelfth day. Between the seventh and eleventh days the patient was delirious, and urine and fæces were passed involuntarily. Nepenthe, hyoscin, and bromides were found beneficial at this time. A few pustules appeared on the buttocks about the twelfth day, but soon dried up. On the seventeenth day desquamation began. The urine between the ninth and eleventh days was slightly albuminous. Further convalescence was uneventful. See "Morbidity."

CRANIOTOMY, PHYSOMETRA, COMPOUND PRESENTATION, ADHERENT PLACENTA, MANUAL REMOVAL—DEATH.

M. G., aged twenty-nine, 3-para; admitted with a history of having eight days previously fallen off the tram; the membranes ruptured shortly afterwards. On examination, the os was found closed, cervix unobliterated, and presenting part not fixed. As there was no evidence of labour she was allowed out, but returned next day having a temperature of 103°, though the pulse was quiet. On examination a foot was found protruding through an imperfectly dilated os, and lying at pelvic brim what was at first thought to be the breech, but proved to be the head. Chloroform was given, and as early escape of liquor amnii rendered version impossible, and an undilated os prevented the application of forceps, delivery was effected by the aid of the perforator and cranioclast. The placenta was morbidly adherent, and required manual removal. It should be added that a putrid discharge was pouring from the uterus all this time. The utmost efforts were made during the following days to restore the uterus to a healthy condition, but douching, packing with iodoform gauze, &c., were all unavailing to prevent death, which occurred on the eighth day.

PRESENTATIONS OTHER THAN VERTEX.

In twelve cases of persistent occipito-posterior presentation the birth of a living child took place unaided. Two brow and three face presentations ended also in the birth of a living child, unaided.

RUPTURE OF UTERUS.

K. G., aged thirty-five, 8-para; admitted on December 27th at 3 30 o'clock p.m. Patient has had a cough for

several months; rhonchi and râles can be heard all over chest; tubular breathing in lower lobe behind on the right side. Some days previously she had been visited by a pupil, who noticed the chest trouble, but as there was no sign of labour, did not continue to visit her. So far as could be ascertained abdominal pains, attended with retching, had begun on the 25th, but she continued to do her household work on that day. On admission she looked very ill, vomited occasionally dark brown fluid; the respirations were rapid, pulse 124, temperature 98.8°. The urine contained a large quantity of albumen. She slept for two hours after an injection of morphin. On palpation the abdomen was found to be very tender and flaccid; the fœtal parts could be felt with unusual distinctness, especially at the fundus, where the cranial bones were felt and heard to crepitate. Per vaginam the cervix was felt to be long and imperfectly dilated; the placenta could be detected in front and low down, attached all round except at left side. I thought I felt a rent in the wall of the uterus, through which the fœtus had escaped into the general peritoneal cavity, but the condition of the cervix and the presence of the placenta made an exact opinion very difficult. With much trouble I reached a foot, which was very high up, and brought it down into the vagina. Some hours later the pulse was 120, temperature 100.6°; no vomiting had occurred since. Chloroform was given and delivery completed. The placenta was detached and drawn down by the funis. The uterus, fairly contracted, lay to right of mesian line; a deep longitudinal tear was felt extending up from junction of vagina and cervix for a considerable distance. The intestines were not perceptible. After copious douching, iodoform gauze was placed in rent and partly in uterus and vagina. Strychnin and digitalin were given hypodermically, but to no purpose, and the patient died about four hours later.

Though I do not believe any treatment could have saved this poor woman's life, I freely admit the rational treatment, at any rate by daylight, would have been to deliver by abdominal section, followed by either removal of the uterus or an attempt to repair the rent.

Other questions of great interest in this case are :—(1) What

caused the rupture ? and (2) When did it occur ? So far as I know the previous labours had not been difficult, and there was no ground for suspecting pelvic contraction. There was no history of violent pains during the few days preceding her admission ; nor of any traumatism arising from a fall or a blow. As to the time of its occurrence, I should conjecture that it was probably twenty-four hours before she came into hospital.

RUPTURED VAGINAL FORNICES.

M. C., aged thirty-five, 7-para ; admitted January 20th, 1903, shortly after midnight, with a history of the membranes having ruptured on the previous day. The os was dilated sufficiently to admit one finger, and the head could be felt lying on the pelvic brim, but not engaged in the cavity ; fœtal heart 144. She was having occasional pains of moderate strength ; she was given 30 drops of laudanum. Some hours later, as she did not appear to be making advance, an examination was made ; the os was found to be two-thirds dilated, the head still lying at the brim. She was now having good pains, and, as the progress of labour was so slow, it appeared wise to give her some assistance, especially as the high position of the hand rendered it very difficult to make out exactly its position. Though the patient's pulse had become somewhat quicker, the fœtal heart was the same as before, and between the pains the uterus was quite relaxed. At 3 o'clock p.m., just before the administration of chloroform, I palpated the belly, and was shocked to find that the fœtal parts could be felt with startling distinctness, and on again listening for the fœtal heart it could not be heard. No complaint of unusual pain had been made, and nothing in her aspect suggested the terrible lesion which had thus so suddenly occurred. Internal examination showed that the head was on the perineum. Delivery was immediately effected with the forceps, and was followed by moderate bleeding ; the uterus became perfectly contracted. As the placenta did not come away, the hand was passed into the vagina, when it was found that the right and anterior vaginal fornices were torn through, and the hand passed up between the layers of the

broad ligament. When the left side was explored it was found that the peritoneal cavity was opened, and the placenta was lying in it. After its removal iodoform gauze was passed into the rent and some left in the vagina. At this time the pulse was good, but before long it became much diminished in force and increased in frequency; the temperature did not fall. The child weighed ten pounds, and the promontory was observed to be very sharp. On the following day the pulse was still more rapid and feeble, the temperature had risen to 101°, and the poor woman died about forty-eight hours from the time the rupture took place.

There are many points of great interest and importance illustrated by this case:—

1. The need for careful watching, and often for early interference in cases, especially multiparæ, where the presenting part fails to engage in the pelvis soon after the advent of labour pains and the escape of the liquor amnii.

2. The difficulty which may for a time attend the diagnosis of rupture. In this instance I was guided to this conclusion by the results of palpation and the sudden cessation of the fœtal heart.

The ordinary signs and symptoms of collapse were absent till some time after delivery. In Dr. M'Clintock's admirable paper on rupture of the vagina he points out (*a*) that it occurs most frequently with head presentations; (*b*) when the head is in the pelvis; (*c*) where some bony projection is present in the pelvis; (*d*) the vomiting of dark coloured fluid is generally absent; (*e*) the fœtus generally escapes into the peritoneal cavity.

The *post-mortem* conditions showed that cœliotomy would have been unavailing.

Dr. Neville made a *post-mortem* to the extent of ascertaining the exact nature of the local lesions. He found that both vaginal and uterine ruptures were more extensive than was anticipated. For the greater part of its course the uterine

rupture, occupying the cervical and lower uterine regions, simply opened into the folds of the right broad ligament, into which had escaped a small amount of blood. But at its highest point this rupture somewhat altered its direction and was here complete—*i.e.*, had opened into the peritoneal cavity posteriorly. The vault of the vagina laterally and partly through Douglas' space was deeply torn, to the extent of opening through the latter into the peritoneal cavity, while the vaginal wall in its upper and posterior third was deeply fissured. The resulting hæmorrhage, as evidenced *post mortem*, was slight in extent, and Dr. Neville did not think that the lesions revealed were such as could have been efficiently dealt with by any operation. Signs of commencing peritonitis also existed.

Decidual endometritis was observed in two cases, both 1-paræ, aged respectively seventeen and twenty-two years. In both a somewhat firm growth on inner surface of uterus could be felt with finger and curette; if handled roughly it bled, and its connection with uterus was too firm to allow of its removal. A high range of temperature prevailed in both patients, but steady improvement followed douches and draining with gauze. In the case of L. S., though the uterus became healthy, the pulmonary phthisis from which she was suffering ended fatally six weeks after her confinement.

PHLEBITIS.

This affection was present in four patients, but in only one was attended with any rise of temperature, and then only for three days. She was a very delicate 1-para, aged twenty-five, admitted April 8 from Mercer's Hospital, suffering from ascites, caused by chronic kidney disease. Labour came on when pregnancy had lasted only 8½ months; the child was very small, and natural efforts effected delivery. Owing to the dropsy, manual removal of placenta became necessary.

MITRAL DISEASE, BRONCHITIS—FORCED DELIVERY.

M. C., aged twenty-five, 1-para, admitted May 14th at 7 a.m. She had been confined to bed for some months owing to mitral valve disease and bronchitis; the pulse was quick, feeble and irregular; there was great distress in breathing and orthopnœa. Pains were fairly regular; os about the size of a five-shilling piece, and head low in pelvis; her face was pallid and lips cyanosed. The dyspnœa and heart's action grew steadily worse, and at 10 o'clock it was manifestly impossible for her to continue the struggle much longer. Though she could not lie down, I succeeded in passing the forceps through the still very imperfectly dilated os, and applied gentle traction; but while doing so matters became so much worse that the patient was at the point of death, so I perforated the head, and delivery was speedily completed. The presentation was occipito-posterior. With the emptying of the uterus a marvellous degree of relief was obtained; in half an hour afterwards the patient was able to lie down, and a favourable puerperium followed, delayed a little by phlebitis in the right leg.

In some of my previous Reports will be found notes of cases in which pregnancy was complicated with organic cardiac disease, in which compensation was so imperfect that even so early as the sixth month the patient was unable to lie down in bed, her sufferings having become steadily aggravated in each pregnancy. In all of these premature labour was induced with the best results. With my knowledge of these facts I am at a loss to understand how good, practical obstetricians, such as Winckel, can advise against this mode of treatment.

CASES OF APHONIA.

Case I.—S. D., aged twenty-eight, 3-para. Without any apparent cause patient lost her voice shortly after labour began; and the condition was even more marked some hours later. Aphonia had occurred during a former confinement also, beginning about the same time, and persisting for some days. On this

occasion the voice became more audible on the second day of the puerperium, and was almost of its ordinary strength on the fourth day.

CASE II.—E. L., aged twenty-nine, 5-para; became quite aphonic on the day following her delivery, and remained so for several days. She had a similar experience on several former occasions at the conclusion of pregnancy.

CASE III.—K. B., aged thirty-two, 7-para. Patient was conscious of her voice becoming weak a few days previous to her admission to hospital. After delivery she could only speak in a whisper. She has had a similar experience on two former occasions.

ENLARGEMENT OF THYROID (?) GLAND IN AN INFANT.

CASE—M. K., 2-para, gave birth to an infant which presented marked enlargement of thyroid, involving isthmus and both lobes; respiration was difficult, owing, apparently, to the pressure caused by the enlargement. Patient states her first infant suffered similarly, but the trouble disappeared in a short time.

CUTANEOUS AFFECTIONS.

Cases of the above observed during the year were few in number and not of any special interest. Two examples occurred of extensive pigmentation of the abdomen, such as sometimes follows the use of arsenic. As in former years, two forms of erythema were observed, and two very trifling cases of pemphigus in infants. In six instances patients were affected with troublesome acne on the chin and nose. This had occurred in successive pregnancies, and generally subsided after delivery. One infant presented a copious papular syphilide on arms, but not on face; and one mother was admitted suffering from general psoriasis.

DECIDUAL ENDOMETRITIS.

CASE I.—C. P., 1-para, aged seventeen, stated she was in good health during pregnancy; gave birth to a living infant after an

easy labour. On the third and following days there was a considerable rise of temperature and pulse, and on exploring the uterus a firm growth was found, especially developed at the fundus and right cornu. It was not possible to detach it thoroughly with either finger or curette, and any attempt to do so was followed by bleeding. Copious douching of the cavity was practised, and it was then packed with iodoform gauze. This proceeding was repeated on several occasions; and convalescence though tardy was satisfactory.

Case II.—L. S., 1-para, aged twenty-two; labour was natural; child alive; a few days afterwards there was considerable pyrexia, and on examination the cavity of the uterus was found occupied by a firm growth, closely adherent to the uterine wall, from which it could not be detached without violence, except in small fragments. Douching and packing with iodoform gauze were tried, but without any appreciable effect on the temperature and pulse. These latter, however, were no doubt aggravated by pulmonary phthisis, of which signs became observable during the first week of the puerperium, and which proved fatal in six weeks from the birth of her infant.

PRIMARY SARCOMA OF THE VAGINA IN THE ADULT, WITH THE NOTES OF A CASE.

By HENRY JELLETT, M.D., F.R.C.P.I.,

Gynæcologist to Dr. Steevens' Hospital, Dublin;

AND

H. C. EARL, M.D., F.R.C.P.I.,

Pathologist to the Richmond Hospital, Dublin.

[Read in the Section of Obstetrics, February 5, 1904.]

SARCOMA of the vagina is so rare a condition that I feel I need make no apologies for publishing the present specimen and for taking advantage of the opportunity to make a few remarks on sarcoma of the vagina in general. So far as I can ascertain this is the first specimen of the kind that has been recorded in Ireland:—

CASE.—A woman, M. T., aged fifty-five, came to me in August last at Sir Patrick Dun's Gynæcological Dispensary, where I was at the time doing duty for Sir Arthur Macan. She gave the following history:—Age fifty-five. Nine children. Last pregnancy eleven years ago. Menstruation ceased five years ago. Two years previous to the present date, she noticed the occurrence of a fairly profuse white discharge, which persisted for about six months, and then became purulent. It has continued up to the present, and at times contains traces of blood. The patient considers that she has been getting progressively weaker during the last twelve months. At times she is seized by attacks of dizziness, followed by extreme drowsiness, both of which again pass off completely. Her appetite is bad, and she is getting thinner. Pain is absent, but she complains of weakness of the back. She informs me that she has not lived with her husband for the last twelve months, and for the two years previous to that only very occasionally. The bowels are fairly regular.

The urine is passed in normal quantities, but for the last four or five months has been escaping involuntarily at times, due probably to weakness of the sphincter. In appearance the patient is a tall, thin woman, very sallow, and looking rather more than her age.

On separating the labia, the mucous membrane at the vulvo-vaginal junction is seen to be completely changed in character, and to present, instead of its normal characteristics, the appearance shown in Plate I. There is an oval area of what is at first sight apparently congested and hypertrophied mucous membrane. This area is defined below from the skin covering the labia minora and surrounding parts by two sharply cut and sinuous edges, which start in front just behind the clitoris and run backwards, one at each side, along the inner surface of the labia minora, to meet at the anterior edge of the perineum. The surface of the included area lies below the level of the surrounding parts, but, as it is covered over with irregular bosses or tubercles, this is only noticeable in certain places, notably on the posterior vaginal wall. These bosses furnish the most characteristic part of the growth. Some are rounded tumuli, while others are blunt topped ridges. They are not unlike the sub-amniotic bosses which are found in cases of decidual endometritis, but are widely different in causation.

Anteriorly, a curious flap is present beneath the orifice of the urethra; its position and form are clearly shown in the drawing. When the patient first presented herself at the dispensary it was very marked, but while she was under treatment it became smaller. At the time of operation it was only half its former size, and has become still further shrunken in the specimen. It was probably due to a chronic inflammatory process which subsided under treatment.

On separating the vaginal walls with the finger the extent of their involvement can be seen. Anteriorly, the growth is limited in an upward direction by the flap already alluded to. Laterally, it extends upwards on the right side about an inch and a half, and on the left side about an inch. Posteriorly, its outline is curious, and appears to take almost the exact course of a recent perineal laceration. The limiting edge starts at the left side of the junction of the posterior and lateral vaginal walls, about half an inch above the vulvo-vaginal junction, runs straight

upwards to a point nearly two inches above the perineum, and then comes straight down again so as to form a very sharp-angled inverted V. This brings it to a point on the median raphé of the posterior wall, nearly an inch above the perineum, from which it again runs upwards to form a second, though much shallower, inverted V on the right side of the median line. From here it runs across the right lateral wall, as has been described, about an inch and a half above the vaginal orifice. The posterior edge is not only sharply cut, but undermined, and I think there can be but little doubt that its course has been determined by the presence of an old perineal laceration. The surface of the growth is covered by a purulent discharge. The entire area is firmer in consistence than the surrounding parts, into which it imperceptibly passes. The growth does not penetrate deeply, but is apparently confined to the vaginal wall and the adjacent tissue.

The vaginal walls above the growth are markedly inflamed, and here and there are small prominences resembling those found in granular vaginitis, and probably similar to them in origin. The mucous membrane of the vaginal portion of the cervix is also deeply congested. It may also be noted that the passage of the speculum caused slight hæmorrhage from the narrowed vaginal orifice, but did not give rise to any pain. Indeed, the parts were curiously insensitive.

As the diagnosis of the case was, to say the least, obscure, I endeavoured for the next fortnight to bring the vagina to a more aseptic condition by the use of vaginal douches, insufflations of iodoform, and the tamponading of the vagina with plugs soaked in ichthyol and glycerine. This reduced the amount of purulent discharge and eventually caused a shrinkage of the small anterior flap to which I have alluded, but, as might be expected, produced no effect on the remainder of the growth. Accordingly, I removed one of the small bosses at the junction of the posterior and lateral wall for examination. The removal caused no pain, but a little persistent hæmorrhage, which was stopped by the application of adrenalin. The site formerly

Plate I.—Sarcoma of the Vagina, seen from below.

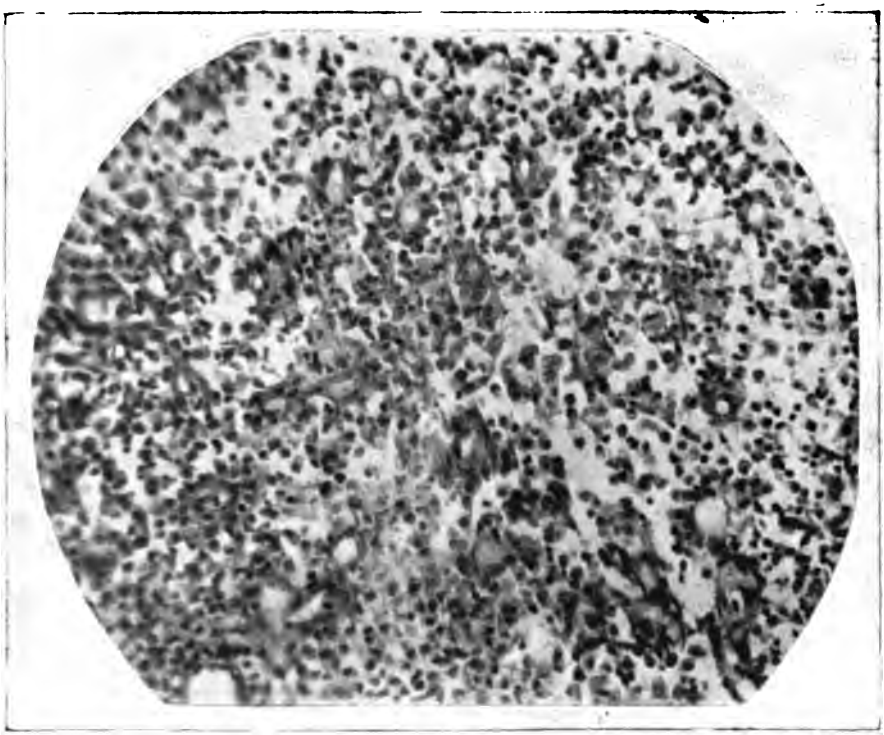


Plate II.—Micro-photograph of section of Sarcoma shown in Plate I. (× 300.) (Wigham.)

occupied by the removed portion can be seen on the specimen, as there was no attempt at repair. Dr. Moorehead, who was then Assistant Physician to the Hospital, very kindly cut several sections of the removed portion for me, and, having examined it, expressed the opinion that it was either sarcomatous in nature or a mass of chronic inflammatory tissue. The sections were then submitted to two pathologists, in the persons of Dr. Earl and Professor O'Sullivan. Both gentlemen declined to commit themselves absolutely without examining another piece of growth; both considered that the growth presented many points of resemblance to a sarcoma; but while one considered that it probably was sarcomatous, the other considered that it probably was not sarcomatous, but a chronic inflammatory process.

By this time the patient had been under treatment regularly twice a week for a period of three or four weeks without any benefit save a diminution in the amount of purulent discharge and a corresponding alleviation of her symptoms. On the other hand, it appeared to me that when the growth was grasped between the fingers and thumb its base had become slightly more infiltrated. Accordingly, I decided to remove it.

Operation.—The removal of the growth necessitated the removal at the same time of at least the lower third of the vagina, and I was at first rather doubtful as to whether the accompanying hæmorrhage might not render the operation difficult. However, this was not so, and the actual operation was comparatively easy. I commenced by injecting into the base of the tumour, at some half dozen different points, a few minims of a 1 in 5,000 solution of adrenalin, and to this was probably due the fact that the operation was comparatively bloodless. The incisions were commenced in front, at the base of the clitoris, anterior to the urethral orifice, and deliminated the anterior quarter of the growth. The urethra was then dissected out, and its terminal

portion removed. The incisions were then carried backwards so as to completely surround the vagina, and partly with the scissors, partly by separation with the fingers, the lower third of the vagina was completely isolated from the surrounding parts. As soon as this separation had extended well above the growth, the vaginal wall was divided circularly and the lower portion removed as a complete ring.

Anteriorly, the cut end of the urethra was then sutured to the cut edges of the inner surfaces of the labia minora, and posteriorly and laterally the divided vaginal wall was easily drawn down and sutured to the perineum and lateral cut edges of the skin. There was no difficulty in drawing down the wall save at one point on the right side, where the growth had extended outwards and upwards more deeply than elsewhere, and here, in consequence, there was some tension on the sutures. The hæmorrhage during the operation was very slight, and only a few small vessels had to be ligated. Finally, the vagina was plugged with iodoform gauze and a firm pad applied externally with a T-bandage.

Convalescence was uneventful, and I removed the sutures on the eighth day. Union was satisfactory all round, save at the point on the right side where there had been tension on the sutures. Here, the latter had cut through and the vaginal wall had retracted upwards, leaving an ugly gaping cavity. This, however, rapidly granulated up, and the patient left the hospital on October 3rd, three weeks after the operation.

After History.—The patient came back to see me on November 9th. She stated that her general health was extremely good, that her appetite had returned, and that she was a pound and a half heavier than when she had left the hospital—a result that, at any rate, shows that she had lost no weight. The cicatrix caused no discomfort, but the occasional urinary incontinence of which she had complained prior to the operation was still present. It could, however, be prevented by emptying the bladder at intervals of a couple of hours, and did not trouble her at all at night.

On examination the junction of the vaginal mucous membrane and skin was complete all round, save at the urethral orifice and at the point where the sutures had cut out and where there had been the greatest difficulty in getting completely outside the growth. The urethral orifice was situated in the middle of a

small, triangular area, which appeared to be formed of granulation tissue, over which the skin had not spread, while on the right side there was a small linear patch of what also appeared to be granulation tissue, from which sprang two delicate, leaf-like flaps the size of a small shamrock leaf. On the probability of these being granulations, I burnt them off with nitric acid.

I saw the patient for the last time on January 21st of this year; the wound was completely healed, and all trace of granulation of tissue had disappeared.

Report by Dr. Earl on the Removed Growth.

"The tumour is an example of infiltrating sarcoma, the rarer of the two varieties met with in the vagina. The new growth forms a layer on the surface, which reaches to the vaginal epithelium and invades it. There is some ulceration, very superficial, and the ulcerated surface is covered in part by a fibrinous membrane. The new growth extends between the bundles of the dense fibrous tissue which forms the mucous membrane of the vagina as far as the muscular coat, which it slightly invades. In some of the sections a tubular gland, lined by columnar epithelium, occurs. It lies in the deep part of the mucous membrane and partly in the muscular coat, and it is invaded by the growth. The cells which form the new growth are small, and most of them are round, but some few are oval or short spindle cells. They have a nucleus which stains darkly in hæmatoxylin and a very distinct layer of protoplasm. There are numerous thin-walled vessels in the growth" (*vide* Plate II.).

I do not propose to enter into a detailed account of sarcoma of the vagina. Two very admirable articles on this rare condition are already to be found in British medical literature. In the Reports of St. Bartholomew's Hospital for 1891 there is an article by Dr. W. J. Gow, in which are the notes of what appears to be the only British case then recorded of sarcoma vaginæ in the adult, and a very complete account of all the other cases he was able at the time to collect. In the *Journal of Obstetrics and Gynæcology of the British Empire* for April, 1902, there is an article by Mr. Roger Williams, in which he

refers to several previously reported cases, and amongst these appear another British case recorded by Morris. Williams' article is, however, unfortunately and unnecessarily complicated by the inclusion of cases due apparently to the engrafting of tumours of chorionic origin on the vaginal wall. There is also available an interesting paper by Otto Seitz, published in Volkmann's *Sammlung klinischer Vorträge*, No. 280, on primary vaginal sarcoma, in which Seitz deals with the cases recorded up to 1900, and adds a case of his own. It may be of interest if I endeavour to bring Seitz' list up to date.

So far as I can ascertain 39 cases of primary vaginal sarcoma in the adult have been so far recorded. In Table I. I have given shortly the general particulars of each case; Table II. shows the histological characters of 38 of these cases; Table III. the relation of the tumour to the vaginal wall; and Table IV. the different ages at which sarcoma vaginæ occurs.

TABLE I.—*Particulars of Recorded Cases*—39 *Cases.*

Case	Age	Situation of Growth	Histological Structure	Result	Recorded by	Reference
1	58	All round lower part of vagina	Round-celled -	Death result of operation	Spiegelberg	"Archiv. f. Gynäk.," Bd. 4, 1872. S. 348
2	—	Lower part anterior vaginal wall	Spindle-celled -	No recurrence after 4 years	Idem	Ibid.
3	15	Lower part anterior vaginal wall	do. -	Rapid recurrence -	Kaschewarowa-Rudnewa	"Virchow's Archiv.," 1872, Bd. 54. S. 63
4	—	Posterior vaginal wall, upper part	do. -	Not mentioned -	Idem	Ibid.
5	38	Lower part anterior vaginal wall	do. -	Death after operation -	Meadows	"Trans. Obs. Soc.," Lond., Vol. X.
6	32	Lower part anterior and posterior vaginal wall	Angio-sarcoma (probable deciduoma mal.)	Rapid recurrence -	Steinthal	"Virch. Archiv.," Bd. 111
7	19	Lower part posterior vaginal wall	Spindle-celled -	do. -	Simmons	"Edin. Obstet. Trans.," Vol. X.
8	23	Lower part anterior vaginal wall	Angio-sarcoma -	Rapid growth and death	Kalustow	"Archiv. f. Gynäkol.," Bd. 40, 1891. S. 499
9	30	Lower part left and posterior vaginal wall	Round-celled -	Recurrence -	Fraenkel	"Deutsch. Zeitsch. f. Prakt. Med.," 1875. Nr. 10
10	25	Lower part posterior wall	do. -	do. -	Bajardi	"Annal. d'Obstét.," Vol. II., 1880
11	39	Lower part anterior wall	do. -	No recurrence after 10 months	Menzel	"Centrabl. f. Gynäk.," 1885
12	38	Lower part anterior wall	Spindle-celled -	Recurrence -	Herzfeld	"Allgem. Wein. Med. Zeitung," 1889
13	55	Lower part posterior wall	Round-celled -	do. -	Langton	"St. Barthol. Hos. Reps.," 1891, p. 97
14	15–20	Anterior wall -	Spindle-celled -	do. -	Wirtz	"Inaug. Diss." Bonn., 1891

TABLE I.—*Continued*

Case	Age	Situation of Growth	Histological Structure	Result	Recorded by	Reference
15	82	Posterior wall	Spindle-celled	Recurrence	Senn	"Amer. Jnl. Obs.," Apr., 1895, p. 565
16	31–40	Anterior wall	do.	No recurrence after 11 years	Rubeska	"Centralb. f. Gynäk.," 1896. S. 113
17	—	—	Spindle-celled (Endothelioma)	Recurrence	Amann	"Kurzgefasstes Lehrbuch d. Gynäk. Mikrosk. Diagnostik"
18	50	Right lateral wall	Spindle celled (Endothelioma)	do.	Jung	"Monats. f. Geb. u. Gynäk.," IX., 1899. S. 373
19	51–60	Anterior wall	Round-celled	do.	Munz	—
20	52	Right lateral wall	—	do.	Jung	*v. supra*
21	41–50	Posterior wall	Giant-celled	Recurrence	v. Rosthorn	"Zur Kenntnis der primären Sarkome der Port. Vag.," Wiener Klinisch., Wochen., 1889
22	—	Anterior wall	Melanotic, spindle-celled	do.	Parona	"Ann. Univ. Med.-Chir.," Milano 1887, p. 241
23	21–30	—	Myxo-sarcoma	No recurrence	Gatti	"Giornale della R. Acad. di Med.," Torino, 1892
24	—	—	do.	—	Ferrari	"Sala Chir. . . . d. Osp. Magg di Bergamo.," 1891, p. 179
25	15–20	Anterior wall	Round and spindle-celled	Recurrence	Ahfeld	—
26	41	Posterior wall	Spindle-celled (Endothelioma)	Result unknown	Seitz	"Samml. klin. Vorträge," No. 280, Leipzig, 1900
27	20	Right lateral wall	Spindle- and round-celled	No recurrence after 2½ years	Morris	"Practitioner," Vol. II., 1898, p. 593

TABLE I.—*Continued.*

Case	Age	Situation of Growth	Histological Structure	Result	Recorded by	Reference
28	49	Anterior wall	Melanotic sarcoma	Recurrence	Horn	"Monats. f. Geburts u. Gynäk.," Nov., 1896, Vol. IV., p. 409
29	—	—	Teleangiectatic	do.	Alglave	"Bull. Soc. Anat. de Paris.," Vol. XII., 1891, p. 657
30	—	Posterior wall	Spindle-celled	do.	Morestin	"Bull. Soc. Anat. de Paris.," 1898, p. 431
31	24	Anterior and lateral walls	Angio-sarcoma	Death from hæmorrhage	Schwartz	"Comptes Rendus Soc. d'Obset., &c.," de Paris, 1901
32	60	Posterior wall	Round- and spindle-celled	Died	Savage	"Brit. Med. Jnl.," Vol. I., 1899, p. 1281
33	44	Anterior wall	Spindle-celled	Recurrence	Macnaughton-Jones	"The Lancet," Vol. I., 1902, p. 439
34	56	Left side	Endothelioma	do.	Klien's	"Arch. f. Gynäk.," Bd. 46, 1894. S. 360
35	14	—	do.	do.	Gerhardt	"Pathologische Anat. der Sexual-organe," Leipzig, 1899
36	55	Posterior wall	do.	do.	Franke	"Mikroskopische Untersuchungen über maligne Tumoren, &c.," Inaug. Diss., Berlin, 1898
37	—	Posterior wall	Round-celled	do.	Gervis	"Trans. Obstet. Soc. of London," Vol. XXVIII., p. 82
38	16	Anterior wall	do.	No recurrence after 6 years	Handfield-Jones	Ibid.
39	55	All round vagina	do.	No recurrence after 5 months	Jellett	——

TABLE II.—*Histological Character of* 38 *Cases.*

Spindle-celled	17 cases	(of these at least six were probably endotheliomata)
Round-celled	9 „	
Angio-sarcoma	4 „	(of these one is probably more correctly considered to be a deciduoma malignum)
Round- and spindle-celled	3 „	
Melanotic sarcoma ..	2 „	
Myxo-sarcoma ..	2 „	
Giant-celled	1 „	

TABLE III.—*The Relation of the Tumour to the Vaginal Wall in* 34 *Cases.*

On anterior wall	15 cases.
On posterior wall	12 „
On lateral wall	4 „
All round vagina	2 „
On anterior and posterior walls ..	1 „

TABLE IV.—*Age of Patients in* 31 *Cases.*

20 and below	7 cases.
21–30	5 „
31–40	5 „
41–50	5 „
51–60	8 „
Above 60	1 „

We thus see that amongst 38 cases of vaginal sarcoma there is a much larger proportion of the spindle-celled than of the other varieties, but at least six of these are in all probability derived from the endothelium of the blood-vessels or lymphatics, and so consequently should rather be termed endothelioma than sarcoma. Four cases are described as angio-sarcoma, but of these at least one would, I think, in virtue of its history, be more correctly termed a deciduoma malignum or chorio-epithelioma. It was described by Steinthal, and occurred

in a multiparà, aged thirty-two, four months after she had been delivered of a hydatidiform mole. On the lower part of the anterior vaginal wall there was a swelling the size of a walnut, with an ulcerated patch on its surface, and on the posterior wall, opposite the tumour on the anterior wall, was a swelling the size of a hen's egg. The uterus was only slightly enlarged. The growth spread rapidly, and filled the vagina. The patient died soon after, but there was no *post-mortem* examination. Even assuming that the uterus was unaffected, there is no difficulty, in view of what is now known of the pathology of the deciduoma malignum, in regarding the tumour in this case as the result of the vaginal implantation of actively proliferating fœtal ectoblast. I notice that Roger Williams also considers such a view of Steinthal's case probable. I have, however, allowed the case to remain in the list of sarcomata, as it was previously placed there by Gow and Seitz.

Vaginal sarcoma appears to arise with slightly greater frequency from the anterior than from the posterior wall; but so far as I can find there is only one case described in which there is the same distribution of the growth all round the vagina that there is in my specimen. This case was one of two recorded by Spiegelberg in a patient aged fifty-eight. The menopause had occurred at forty, and a year prior to the time at which she came under treatment she noticed a gradually-increasing bleeding from the vagina. The patient was pale, but well nourished. Close to the vaginal orifice, and involving the lower portion of the vagina, was an irregular, firm infiltration of the vaginal mucous membrane, elevated above the level of the healthy tissue, with hard everted edges and a granulating surface, which bled on being touched. In the middle of the posterior wall was an isolated nodule the size of a pea.

The uterus was atrophied and intact, and there was no involvement of the pelvic organs. The inguinal glands were not swollen, and the abdominal and thoracic viscera appeared to be healthy. The growth was removed, but the patient died a week later of septic infection. Microscopical examination showed that the growth was a round-celled sarcoma.

The age of the patients varied from fourteen in the case of endothelioma recorded by Gerhardt to eighty-two in Senn's case of spindle-celled sarcoma. Seven cases occurred prior to twenty-one, twenty-two cases between twenty-one and sixty, and one case after sixty. The disease occurred with equal frequency during the three decades between twenty and fifty. Between fifty and sixty the largest number of cases occurred. I have not been able to ascertain the relative frequency of the two main types of vaginal sarcoma—the infiltrating type and the circumscribed type. There is no doubt, however, that the infiltrating type is very much the rarer of the two. Indeed, in addition to Spiegelberg's first case, the description of which I have quoted, and to my own case, I cannot find a distinct statement that any of the others were of this type. It is, however, probable that some of those described as angio-sarcoma may have been so.

The prognosis of vaginal sarcoma is, judging from the history of the cases I have collected, distinctly bad. Seitz states that only three cases have been recorded in which the disease was removed and did not recur. These are Spiegelberg's second case, in which there was no recurrence after four years; Gatti's case, in which there was no recurrence after several years; and Rubeska's case, in which there was no recurrence after eleven years. To this number may, I think, be added Morris' case, in which there was no recurrence after two and a half years, and

Handfield-Jones' case, in which there was no recurrence after six years. Menzel's case, in which there was no recurrence after ten months, cannot be added to the list of successful cases, as the period for which it was watched is not sufficiently long. For the same reason, my own case cannot as yet be included, as only five months have elapsed since the operation. I hope on a future occasion, as soon as a definite conclusion can be formed as to the result of this case, to complete these notes.

In conclusion, I must express my indebtedness to Dr. H. C. Earl for his report on the specimen and for his kindness in looking into the bibliography of the subject. I am also indebted to Mr. Roger Williams and to Dr. Macnaughton-Jones for additional references, to Dr. Arthur Ball for some very excellent photographs from which Plate I. was drawn, and to Dr. Wigham for the micro-photograph shown in Plate II.

REPORT OF LAST YEAR'S WORK IN THE GYNÆCOLOGICAL WARDS OF THE MATER HOSPITAL, BELFAST.

By ALEX. DEMPSEY, M.D., Q.U.I.;

Physician to the Mater Infirmorum Hospital, Belfast.

[Read in the Section of Obstetrics, March 11, 1904.]

Let me say at the outset that I have nothing new to communicate in this paper. My object in submitting this Report to the Academy is for the purpose of eliciting information in the discussion which I hope will follow.

No annual report of the Mater Hospital has been issued to the public for some years. The medical staff of the hospital were, therefore, not periodically called upon to summarise their work during these years. At the end of the last financial year I thought I would like for my own satisfaction to have a list of the operations done in my department during that period. My house physician very kindly tabulated them for me. This Report will deal with the operations recorded in that list and performed between the 1st November, 1902, and 1st November, 1903.

As a number of operations for different diseases will be referred to, my remarks on each class of operations must necessarily be brief. I do not propose to waste your time with any detailed notes of cases.

During the year 107 patients had operations performed on them. Of these, 44 were curetted for metritis and endometritis, 5 for incomplete abortion, and 2 for advanced cancer of the uterus. Four patients had the breast incised for scirrhus, and one for a large cyst. One

had hæmorrhoids removed by clamp and cautery, 4 had operations for rectal fistula and fissure of the anus; 4 had perinæorrhaphy performed for ruptured perineum; 3 had trachelorrhaphy done for laceration of the cervix. In 2 patients I excised the vulva for tubercular ulceration, and in 3 the hymen for ulcerations and vaginismus.

I operated on one vesico-vaginal fistula and on two recto-vaginal fistulas. I removed one submucous fibroid by morcellement, and there were five cases of urethral caruncle either excised or cauterised. There were 25 intraperitoneal operations performed during the year, 2 being for papillomatous cysts of the ovaries, 2 for extra-uterine fœtations, 1 for adhesions of stomach and bowels, 1 for diseased appendix, 9 for cystic ovaries, 9 for fibroid and fibro-myomatous tumours of the uterus, and one for an intraperitoneal abscess.

There was only one death in the wards during the year.

Patients who require curetting are always admitted into the hospital and are submitted to a course of antiseptic douching for two or three days prior to the operation. If the leucorrhœal discharge is profuse and purulent the preparatory treatment is more prolonged. If there has been a recent gonorrhœa the operation is deferred until the acute stage has been passed. I think there is a special danger of septic infection being caused by curetting during the acute stage of gonorrhœal vaginitis and endo-metritis.

Up till recently creolin has been used in all vaginal operations as an antiseptic. Lately I have taken to biniodide of mercury—1-2,000—as a more reliable douche.

Dilatation is usually done up to No. 11 Hegar, but often, if the difficulty of dilating is very great, I am content with No. 9 Hegar, as it permits equally well of thorough curettage.

In cases of incomplete abortion, where large pieces of placental tissue have to be scraped away, a dilatation to 12 or 13 Hegar is always made, as it enables of a free manipulation of the flush curette and the easy discharge of all *débris*. After curetting, except in incomplete abortion cases, I apply strong carbolic acid in crystals to the endometrium. The intra-uterine douche is used both before and after this application.

I have ceased packing the uterus after any of these operations. I have always found it locks up the secretions inside the uterus, and I doubt if it assists in diminishing the size of that organ by producing contractions to expel the foreign body. For the purpose of toning up and contracting the uterus I always put the patient, after curettement, on a course of ergot and strychnine, with or without quinine, for three weeks or a month.

To assist the operation and effect a cure I regard rest for ten days in bed after curetting as a most essential part of the treatment. For the relief of the ovarian tenderness and the pelvic pains which these patients usually suffer from, more is required than simple curetting. This operation should be followed by treatment directed to the relief of these symptoms. I have had very satisfactory results in such conditions by the use of the hot dry-air apparatus introduced by Reitter, of Vienna. By this apparatus temperatures of 120° to 150° Centigrade can be obtained, and when made to act upon the lower abdomen its therapeutic advantages are most marked. It not only relieves those vague pains which we are too readily inclined to attribute to hysteria, but it induces absorption of cellular exudates in the broad ligaments and pelvis in a very satisfactory way. It is, however, not suitable where there is active inflammatory mischief going on.

The disappointments, which I expect everyone meets with in the failure of curettage to cure the disease for which it is performed, are due, I think, to too much reliance being placed on the operation as the one remedy necessary to effect a cure. In many cases curetting should be regarded as the first step in the treatment, to be followed by other measures directed to the particular constitution of the patient and the presence of other local pathological conditions.

It is only in the arrest of hæmorrhage depending upon the retention of a piece of placental tissue left behind after an abortion that we see the immediate good and permanent effects of curetting. I think, however, it is bad practice to use the curette, or even the finger, to clear out the uterus at once in every case of inevitable abortion which we are called upon to attend. I have had the advantage of a fairly large obstetrical practice for close on thirty years, and I have never had a death, or, I might say, even morbidity, as a result of abortion. I leave the patient alone until the amount of hæmorrhage requires attention. Then antiseptic tamponage for twenty-four hours, with the administration of a few full doses of ergot, will bring the ovum in its entirety into the vagina, or so low down in the uterus that it can be removed by the finger without the slightest trouble.

The value of curettement in cancer of the uterus too advanced for radical operation is very great. Only two such cases came under treatment during the year. It is impossible in a general hospital to do justice to these unfortunate cases. But if the diseased tissue were scraped away frequently, and then touched over with some caustic, all foul-smelling discharges could be prevented, and the patient would enjoy comparative comfort. Since about fifteen years ago, when I had an opportunity of treating a

private patient in this way, I have been convinced of its usefulness. I saw her every second day or so, and as soon as any discharge occurred, or any diseased tissue appeared, I scraped it with a blunt curette and applied to the surface acid nitrate of mercury. This gave her very little pain, and it kept her dry and comfortable to the end.

In all tumours of the breast in which I have any doubt as to their malignancy I advise excision. Five mammary glands were removed during the year. Four were affected with scirrhus, and one had a cyst so large as to require complete removal of the breast. The axillary glands were affected in all the scirrhus cases, and were cleared out. In doing this I make a complete dissection of the axilla, removing all the glands and cellular tissue. Glands up, under, and above the clavicle are removed if found enlarged. In one of the cases I removed the thoracic portion of the pectoral muscle, because the growth was firmly adherent to it.

Perinæorrhaphy was performed in four cases for extensive tears and commencing prolapse with satisfactory results. The method recommended by Tait was adopted in all the cases. In incomplete lacerations, if the incisions at the sides are made deep and the parts accurately brought together from the bottom of the wound upwards, no method gives better results.

Two cases of extensive ulceration of the vulva were admitted which had resisted a great variety of local and constitutional treatment outside. In one case the clitoris, the anterior commissure, the labia minora, and the adjacent surfaces of the labia majora and mons, and far up into the vagina, were affected by tubercular ulceration of nearly two years' duration. I excised the entire area well clear of all disease and brought the edges together above on the mons veneris and down the anterior com-

misure to the urethra. The labia majora were sutured to the mucous membrane of the vagina. Though there had been extensive removal of structures and apparent mutilation, when the sutures were completed the parts again assumed a fairly normal appearance, and united admirably.

The second case was less extensive, but was treated in a similar way, and did well.

The case of vesico-vaginal fistula which was operated on had an opening of three-quarters of an inch in diameter. Closure was effected by flap-splitting and suturing with silk in the long direction of the vagina. The catheter was passed every five hours for six days. No leakage occurred until the sutures were removed on the tenth day, when some came away from a small pin-hole opening which required two subsequent operations to close. The catheter was tied in in the last two operations for a week.

Of the two recto-vaginal fistulas which were operated on the first was:—

A patient, aged twenty-three, a primipara, who had been confined ten months previously. The fistulous opening was about one inch in diameter, and was low down near the sphincter. There was only a thin band of tissue in the recto-vaginal septum at the perineum. I retained this band, but forcibly stretched it and the sphincter, taking care not to tear through the band.

I then did a Tait's perinæorrhaphy, separating the flaps, including the narrow band, well up into the vagina, and to at least half an inch above the highest point of the fistula. The edges of the fistula were then united by buried catgut sutures on the vaginal side, avoiding entry into the rectum. Long silkworm gut sutures were then passed from one side to the other, buried throughout their entire extent. Before tying them a further layer of catgut buried sutures, superimposed on the first, were passed to draw together the deep parts of the wound. The silkworm gut sutures were next tied, and then the fistulous opening in the vaginal mucous membrane was brought together by another set of fine silk sutures. The bowels were moved by a purgative on the

second day after the operation, and kept open by daily purgatives until the sutures were removed, on the twelfth day, when complete closure had taken place.

The second patient was a large, flabby, stout woman, sixty-two years of age, with a large irregular fistula, extending high up in the vagina, about two and a half inches by one inch. It had been in existence for twenty years, and its margins were puckered and distorted by firm and dense cicatrices. With the exception of a band about the thickness of the little finger at the perineum the recto-vaginal septum was open from the sphincter to Douglas' space. This band was so hard that dilatation could not be satisfactorily performed.

The steps of the operation were similar to the previous one, and closure was effected in the same way. After the operation the bowels could not be got to act until large repeated doses of different purgatives had been administered. Diarrhœa then set in, and the motions came away involuntarily, soiling the dressings. On making a digital examination of the rectum on the seventh day it was found to be filled by an immense scyballous mass. The tension of the sphincter had occasioned this block, and there was a deep cloaca above the vaginal band referred to, in which the fæcal mass lay. This mass was broken down with the finger, and removed with considerable difficulty, and the bowels washed out with an enema. Stitch abscesses formed and perfect closure did not take place. A good perineum, however, had been established by the operation, but a fistulous opening existed in the centre of it, and a small fistula, about half an inch in diameter, remained inside the vagina.

A second operation was performed about one month after the first to close these openings, with complete success. The patient was obliged to leave for home seventeen days after the second operation. When she left there was only a small opening externally in the new perineum communicating with the bowel, which has since closed. The good result obtained by the second operation was due to more perfect dilatation of the sphincter at the operation, and more careful attention to the bowels after it.

Twenty-five laparotomies were performed during the year, with one death, which was the only death in the gynæcological department during the year.

This patient had been operated upon for an ovarian cyst in Sir Patrick Dun's Hospital two years previously. She presented a marked cachetic appearance, was much wasted, and suffered a good deal of pain. Her entire abdomen was filled with a resistant swelling, bulging down into Douglas' space and both sides of the uterus. The patient was in a very weak condition, but as she desired an operation I decided to make an exploratory one. I found a papillomatous cyst, as I had anticipated, with extensive proliferations and adhesions. The tumour was adherent to the spleen, intestines, bladder, uterus, and abdominal wall. Some of the adhesions near at hand separated very easily, and I was tempted to go on until hæmorrhage occurred so severe as to necessitate the complete removal of the tumour. All hæmorrhage was checked before closing the abdomen, but the patient was collapsed after the operation, and died seven hours afterwards.

I operated on another papillomatous cyst during the year, which was also diagnosed before operation:—As in the previous case, the patient was much wasted and extremely weak. Her greatest trouble was an inability to retain her urine. I made an exploratory operation and found proliferations so extensive that I contented myself with separating the adhesions binding down the bladder. She recovered from the operation without the least inconvenience, and she got immediate relief from the bladder trouble, and left hospital a month afterwards.

I regard it as useless to remove papillomatous cysts when sprouting has taken place throughout the abdomen. The entire disease cannot be removed, and the patient's condition is very little improved, and I doubt if life is anything prolonged by a partial removal.

Ovariotomy was performed in eight cases with good results.

One had a septic peritonitis for two months before the operation, and was very much wasted. Her temperature ranged between 100° in the mornings and 103° in the evenings. She had a pulse averaging about 120. I waited for nearly six weeks in the hope

that the fever would subside, because I was afraid, if operated on, she would either die on the table or get general septicæmia afterwards. As no improvement took place, and as death seemed quickly approaching, I gave her the chance of operation. The tumour, which filled the abdomen up to the costals, was a multilocular ovarian cyst, and one of the cavities was filled with pus. There were general adhesions all over, which broke down very easily. The usual signs of peritonitis were present, but there was no pus in the abdomen. I flushed her out well with warm saline solution, and left a considerable quantity inside the abdomen. Her temperature was normal the evening of the operation, and fluctuated very little afterwards, and she made a good recovery.

There were two cases of ovarian cysts with twisted pedicles. Both had histories of inflammation. One was diagnosed as appendicitis, and was sent to hospital for appendicectomy. The tumour was not a large one, and, owing to the tympanitic distention of the abdomen, the mistake was perfectly excusable, but on careful examination the nature of the case was evident. In the other twisted pedicle case the cyst was completely encircled with omentum, and the vessels of the pedicle thrombosed. These two cases recovered without a bad symptom.

One patient, a small woman, had an enormous ovarian tumour. It hung down over her pubes to her knees. It contained twenty pints of fluid. It was adherent to the front wall of the abdomen over its entire extent.

There were two cases of dermoid cysts and one of parovarian cyst. The remaining case was a simple unilocular cyst, deserving of no comment.

Nine retro-peritoneal hysterectomies for fibroids and fibro-myomatous tumours were performed during the year. Some were large tumours, filling the abdomen; others were small bleeding myomas. Some were multiple, and had projections which pressed on the bladder in front and

on the rectum behind. The largest was in a patient who had passed the menopause, and who had had the tumour for ten years. After the change of life it began to enlarge and incommode her in different ways. This activity in the growth of a fibroid after the menopause is the reverse of what one has been taught to expect, but I have seen it occur in two or three cases.

I had no deaths among my hysterectomies. The majority of them recovered without having any elevation of temperature to speak of.

I do not now put any ligatures in the stump of the uterus except there is bleeding. If there is no bleeding there is no necessity for them, and I look upon every additional ligature which one has to use inside the abdomen as an increased danger to the patient. The want of certainty which one always has about the sterility of even the most carefully-prepared catgut makes one chary about using it except when absolutely necessary. I make it a rule in all patients for abdominal section, and more especially for abdominal hysterectomy, to give them thorough antiseptic douching for at least a week before the operation. This, I think, sterilises the canal of the cervix, and so prevents the danger of septic trouble afterwards about the stump. I use silk ligatures for all the vessels, and catgut for suturing the peritoneum over the stump. The catgut is prepared by Bergman's method. In all abdominal operations I believe in free purgation before the operation and light diet for a few days. The bowels give less trouble if empty at the operation, and there is less liability to tympany after. I put hot normal saline solution into the abdomen in every case. I suture the abdominal wound in three layers—peritoneal, muscular, and cutaneous—using catgut for the buried layers. I believe I have had firmer union since I have

commenced this method. In all my cases I give practically nothing by the mouth for the first forty-eight hours after the operation. A teaspoonful now and again of toast water is all they get. Nutrient enemata of peptonised milk and egg and of Brand's essence, or other preparation, are given every six hours for three days, and then eased off. The bowels are moved by a saline aperient on the third day.

The two extra-uterine fœtation cases were diagnosed and operated on before rupture. One was almost entirely ovarian. The sac was between the fimbriated extremity of the Fallopian tube and the ovary—a large cavity in the latter being filled with placental tissue.

I saw this patient in the extern soon after pregnancy had taken place. She came complaining of pain in the left iliac region, and of an uncomfortable, uneasy feeling which made her apprehensive of something serious being wrong with her. I found the left ovary somewhat enlarged and tender, and applied some ichthyol tampons. She came every week, and the ovary seemed steadily to enlarge. She missed her period, and then about the sixth week she began to have hæmorrhage. I then brought her into hospital and operated on her.

An interesting feature in the second case was the presence of a dermoid cyst on the opposite ovary of the size of the fœtal head, which I removed at the same time.

It was filled with teeth and hair, and lay deep down on the left side of the uterus, surrounded by a mass of adhesions.

The diagnosis of an extra-uterine fœtation is, in my opinion, a fairly easy matter. The difficulty is to tell when it has ceased to grow and to be of danger to the patient. Extra-uterine fœtation must, I think, be of comparatively frequent occurrence, and the majority of

the patients recover without any very alarming symptoms. They grow up to the sixth or seventh week, when a hæmorrhage occurs within the sac, or a tubal abortion takes place without much hæmorrhage, and they cease to give further trouble.

A patient who misses a period, and then gets attacks of irregular hæmorrhages, accompanied by the discharge of shreds of tissue, should be at once suspected of having an ectopic pregnancy. If at the same time an examination discovers a swelling at one or other side of the uterus of a size corresponding to the period of suspected pregnancy, which bimanually is found to move more or less independently of the uterus, the suspicion is strengthened.

Further, if from the time of the suspected pregnancy there has been a painful and an uncomfortable feeling in that side of the pelvis, which has been unaccompanied by fever or other indications of inflammation, the diagnosis of extra-uterine fœtation is fairly clear.

Should one have an opportunity of watching the patient for a couple of weeks, and if the tumour is found to grow perceptibly from week to week, there can be no doubt about the diagnosis. The condition of the breasts and discolouration of the vagina may also furnish a further corroboration.

Unless active symptoms have been absent for a considerable time and the tumour shows signs of becoming smaller in size, I advise immediate operation. No one can tell when an alarming hæmorrhage may occur, which may, perhaps, carry the patient off in a few hours. The tubal case referred to in this paper was on the very point of rupturing when operated on.

The patient with the intra-peritoneal abscess which I operated on had been in hospital for two months. She was very much wasted, and had hectic symptoms. There was

a large swelling on the left side of the uterus, rising up half way to the level of the umbilicus on that side. No fluctuation could be discovered per vaginam or by abdominal palpation. On opening the abdomen and separating a mass of adhesions between coils of intestine, I came down upon an abscess at the side of the uterus, dipping down pretty deeply into the pelvis. It contained about 4 oz. of pus. The cavity was thoroughly cleaned out and drained through the abdominal wound. It dried up and did well, but signs of tubercular disease appeared at the apex of the left lung, and the fever continued. She was discharged from hospital six weeks after the operation.

The stomach case operated on was a weak, thin woman, fifty-five years of age. For about twenty years she had suffered from gastric pain and dyspeptic symptoms. Two years ago I performed ovariotomy on her for a large ovarian cyst. At this operation I found adhesions between the transverse colon and the abdominal wall. The upper cavity of the abdomen was completely walled off by these adhesions. It was impossible to separate them through the ovariotomy wound, and the patient was not in a condition to bear a more severe and prolonged operation. The removal of the ovarian cyst, as was to be expected, gave no relief to her gastric troubles. On the contrary, she became thinner and weaker. I brought her into hospital again in July last and operated on her for the purpose of separating these adhesions. They were found to be most dense and extensive. One thick fibrous band extended from the left lobe of the liver to the lesser curvature of the stomach. It was an inch broad, and about one-eighth of an inch thick. The liver about where it was attached was quite black. I cut through the band with a scissors, and it separated widely without the least hæmorrhage. The adhesions between the stomach and transverse colon and the abdominal wall were broken down and divided with great difficulty. Some between the pylorus and liver were too intimate and dense, and had to be left, as the patient had twice ceased to breathe for a time during my attempts at separation. She recovered from the

operation very satisfactorily, and, though not relieved of all her symptoms, she now enjoys better health than she has had for years.

I cannot conclude this brief record of my work without expressing my indebtedness and thanks to my colleague, Dr. Moore, for his able assistance at almost all my abdominal operations, and I also thank you, Mr. President and gentlemen, for the opportunity you have given me of reading my paper before this meeting.

TUBERCULOSIS OF THE VAGINAL PORTION OF THE CERVIX, WITH NOTES OF A CASE.

By ALFRED J. SMITH, M.B., F.R.C.S.;
Gynæcologist to St. Vincent's Hospital, Dublin.

[Read in the Section of Obstetrics, February 5, 1904.]

It is not my intention to occupy your time at any length. I thought it would interest the members of this Section to bring under their notice a case of tuberculosis of the vaginal portion of the cervix.

The patient, aged twenty-five, was sent to me last January by Dr. Fullam, of Swords. She stated that she was nine months married, that she became pregnant three months after marriage, and that she considered she had an abortion, brought about by straining herself in crossing a gate when ten weeks pregnant. Soon after she noticed pain, which she referred to the right ovarian region. The pain became worse, and irregular hæmorrhages and unpleasant discharges came from the vagina. The history of the case, as given to me, was that of an incomplete abortion, with foul-smelling discharge. The patient's temperature on admission was 100.4° F., which I put down to septic absorption.

On examination under ether I noticed on douching with glass tube that fresh blood came away.

On making a vaginal examination I felt, on the vaginal portion, a soft mass, which bled and broke down easily on pressure—just the sensation one associates with carcinoma. The fundus was normal in size and consistency; both ovaries palpated normally.

On inspection a fungus ulcerating mass projected more or less uniformly around the os; it broke down easily on pressure with the finger, causing a well-marked hæmorrhage. I provisionally diagnosed cancer, and I cut a piece out for examination under the microscope. Dr. William Dargan kindly examined the specimen, and he reports:—

"*Report on Portion of Ulcerated Cervix sent by Dr. Smith.*

"Sections through the excised fragments of cervix show the presence of a well-marked ulcer. The surface, completely denuded of epithelium, is clearly defined from the healthy tissue covered with stratified squamous epithelium. It is formed of caseous and partially necrotic cervical tissue, with some leucoytic infiltration.

"The tubercular process has extended pretty deeply into the muscular tissue, separating where it has not destroyed the muscular fibres, and sparing here and there blood-vessels. At the advancing part typical tubercular system can be made out between the muscular bundles, with their great cells and epithelioid cells, and suggest having been found in the lymph spaces, as many of them are completely surrounded by normal muscular bundles. The occurrence of the tpyical cell-systems and the large size of the giant cells is an indication of the chronicity of the process. Tubercle bacilli could not be demonstrated in the sections.

"Tubercle affecting the uterus is usually confined to the mucous membrane, and does not affect to any great extent the muscular tissue."

Treatment.—Before performing any radical operation I deemed it advisable to have the lungs examined. Dr. Dargan reports both lungs affected with tuberculosis, and large quantities of tubercular bacilli were found in the sputum; consequently I did not perform a hysterectomy, but contented myself with palliative measures. I curetted the fungating mass away and cauterised the surface with chloride of zinc.

It is not my intention to discuss the entire question of tuberculosis of the female genitalia, or yet to contrast the several varieties in which the tuberculosis of the cervix is met with—whether the ulcerative form, which is the most common; the papillary, which Emanuel considers to be characteristic of cervical tuberculosis; miliary tuberculosis, or the "bacillary catarrh" of Shütte. These are the recognised divisions, and require no elaboration from me. But I should like to direct your attention to some points which seem to me to have a distinct bearing on this particular case.

The chief points of interest seem to me to be—

1. The rarity of this affection.
2. The considerations as to the source of the infection.
3. Some points in differential diagnosis.

The Rarity of Tuberculosis of the Cervix.—This is the first case I have ever recognised, and I cannot find in the "Transactions" of the Academy a report of any such case. Dr. John Murphy, of Chicago, in an excellent series of articles on tuberculosis of the female genitalia, in the *American Journal of Obstetrics*, considers this extremely rare. He says that Spaeth in 119 cases of uterine tuberculosis found the cervix affected in only 6. Vasmer, in 6 cases of tubercular endometritis, reports cervix free from change. Stolper reports 9 cases of genital tuberculosis, in 1 of which the cervix was involved.

In 87 *post-mortem* examinations on tuberculous women by Doran there was involvement of the genitalia in 5, but of the cervix in 1 only. Geil records 2 cases in which the fundus, tubes and ovaries were tubercular, yet the cervix remained free. Our home authorities—notably Galabin, Jellett, Roberts, Sinclair, Jones, and others—agree with this estimate of the frequency of cervical tuberculosis, and consider it rare.

It is strange that Lewers, in the 1897 edition of his work, makes no mention of tuberculosis of the cervix, and I cannot quite follow the dogmatic statement of Herman, on page 403, in his "Diseases of Women" (1899), where he says, "I have never seen or heard of a case in which these signs or symptoms produced by tuberculosis led to the suspicion of cancer."

Consideration as to Source of Infection.—How was the tubercle bacillus introduced into the vaginal portion? The external communication of the vagina would seem to admit *à priori* infection, either through the atmosphere by

dust, the introduction of infectious bodies or of tuberculous semen, or are we to consider it as secondary and metastatic, the microbe having travelled in the blood or the lymph?

There was no evidence of intestinal or peritoneal infection; the palpation of the abdomen and the absence of any history of diarrhœa negatived this origin. I wrote to Dr. Fullam to ascertain for me the family history and to find out if the husband had any evidence of tuberculosis in the testicles. He wrote to me on March 12th a most interesting communication:—"The husband," he writes, "is a sound, strong, sober young man, who was never ill since he had scarlatina in early youth. Both his father and mother died at an advanced age. Mrs. C.'s family is also clear of any taint, all the members of it being strong; some are married and have healthy families. I knew both before marriage, and they were as healthy a pair of young people as you could see. After their marriage they went to live in what I call an infected house; an old man died there of phthisis just before they got possession of it. All the members of this old man's family suffered from tuberculosis. It was a virulent type, for a fine fellow who married one of his daughters contracted tuberculosis, and died soon after their marriage."

I quite agree with Dr. Fullam that this poor woman most probably got infected in her new home. What an object-lesson for sanitarians.

Was the Infection Primary or Secondary?—I take Emanuel's case, as reported by Dr. John Murphy, Chicago, as typical of primary tuberculosis. A woman of fifty had a tumour of the cervix the size of an apple, with invasion of the vagina. Microscopic examination showed tuberculosis; hysterectomy; death. *Post-mortem* examination showed the lungs healthy. There was miliary tuberculosis of the liver, spleen, and peritoneum. The cavity

of the uterus was filled with caseous masses. Since the tubes were absolutely unaffected, Emanuel believes this proves the disease to be primarily in the cervix. What confirms it, in his opinion, is the considerable increase in size of the cervix and the invasion of the vagina. In cases of secondary invasion of the cervix he held there is no such increase in size. In my case there was certainly no considerable increase in size of the cervix; it seemed fairly normal, and although I had not as yet an opportunity of inspecting the condition of the tubes, the patient is still alive. When palpated they were fine and small, conditions which one does not associate with infected tubes. There is not sufficient evidence to justify me in classifying it as either primary or secondary; if primary, what determined the localisation to the cervix? I should be inclined to consider it analogous to the two cases narrated by Williams of ulcer of the portio-vaginalis, which on *post-mortem* examination showed tubercular nodules and bacilli. The lesion was clearly limited to the vaginal portion of the cervix and the neighbouring part of the vaginal mucose; the rest of the genitalia was absolutely normal. In both patients there was extreme pulmonary disease.

Points in Differential Diagnosis.—Clinically, the differential diagnosis between tubercular or syphilitic ulceration and carcinoma is sometimes extremely difficult. The diagnosis must be, as Beyea aptly puts it, always that of suspicion, to be made positive by microscopic examination of fragments removed by cutting, not by the curette. Nevertheless, certain points, on closer examination of my cases, are of help. There was no hardening or infiltration of the cervix as one finds in carcinoma. The cervix was of normal suppleness. The hæmorrhage, when the mass was broken by the finger pressure, was not at all as profuse as we are accustomed to find in carcinoma.

SOME OF THE NEWER METHODS OF OPENING AND CLOSING THE ABDOMEN.

By E. HASTINGS TWEEDY, F.R.C.P.I.;
Master of the Rotunda Hospital, Dublin.

[Read in the Section of Obstetrics, April 15, 1904.]

THERE is no more remarkable fact in the surgery of the present day than the want of unanimity existing as to the best method of opening and closing the abdomen in abdominal operations for pelvic disease The propriety of a vertical incision has only recently been called in question. It is still the operation of election amongst British surgeons, but on the Continent the transverse incision has largely superseded it. This plan, since my appointment to the Rotunda Hospital in November last, I have adopted in 19 cases, and it is to the result of my observations in these that I now desire to draw attention.

Let me first say that the transverse incision is performed in two ways, different, but not antagonistic, and which of the two the operator adopts depends entirely upon the object he has in view. If his purpose be to obtain the most extensive view ever yet attempted of the pelvic regions, he should proceed as Mackenrodt does in his very radical operation for uterine cancer. The skin, fascia, recti muscles, and peritoneum are divided by a long, slightly-curved incision, close to and above the pubes; portions of the oblique muscles at either side will probably be also severed, and by this an extraordinary clear view and extended field will be obtained in which to operate. The incision is a formidable one, necessitating as it does the severance of the muscular supports of the abdomen, the proper union of which can never be hoped for; a weak scar

is more than likely to result, and save for the removal of the cancer I know of no justification for such an incision. If, on the other hand, the object is not primarily that of obtaining an extensive view, the second method will be found applicable, and, I believe, preferable in many cases in which a vertical incision has heretofore been made. In it a transverse and slightly-curved opening is made at the margin of the pubic hair, through skin, adipose tissue, and sheaths of the recti. These structures are raised as a thick flap above and below the incision, from the muscles lying beneath them. The division between the recti can now clearly be made out; the latter are separated and the abdomen opened in the usual manner. The advantages of such an incision are manifest. In the first place, it runs in the direction of the elastic fibres of the skin; as a rule the parts fall naturally into position on the completion of the operation, and the fear of hernia is reduced to a minimum; the severed aponeurosis is, throughout the greater part of its course, protected by the muscles, and it is only the transverse slit extending between these that could by any possibility permit of the escape of the abdominal contents. The application of a few interrupted sutures, superficially placed in the muscles, sufficient to keep them in apposition until adhesions form between them and their overlying fascia, will effectually prevent the occurrence of hernia. The scar left after such a wound has no tendency to spread. It runs in the direction of the natural wrinkles of the abdomen, and has the added advantage of being covered by the pubic hair.

I have on several occasions curved the incision to a considerable degree in order to obtain more room. This I now look upon as a procedure to be avoided if possible, as it adds to the unsightliness of the scar. This method of operating should be confined to the less severe abdominal

TWO VIEWS OF TUBE, OVARY, AND HÆMATOCELE OF BROAD LIGAMENT.

(Early Tubal Pregnancy, which, having ruptured into Broad Ligament, has caused a large blood-tumour of the latter.)

Patient married, aged forty-two, VI.-para. Last pregnancy two years ago, and had not—at date of operation—menstruated for twelve weeks. Previously regular.

Per Vaginam, uterus found to be pushed forward by a rounded elastic mass, size of a large orange. This mass lies low in Douglas's pouch. Seems to have a broad attachment to right side of uterus.

On opening the abdomen, uterus is found to be extensively adherent to surroundings by firm adhesions. On disengaging intestines the uterus is seen to be pushed forward by a mass of about the size of an orange. This mass was of a deep purple-blue colour, lying posteriorly and a little to the right of the uterus. The entire rounded mass was bound by adhesions similar to those which had fixed the uterus. Having removed these the tube was found distended in its entire length to fully twice its normal size, while its fimbriated end showed fimbriæ bound and clogged by blood clot. Close to the uterus were three distinct torsions of the tube.

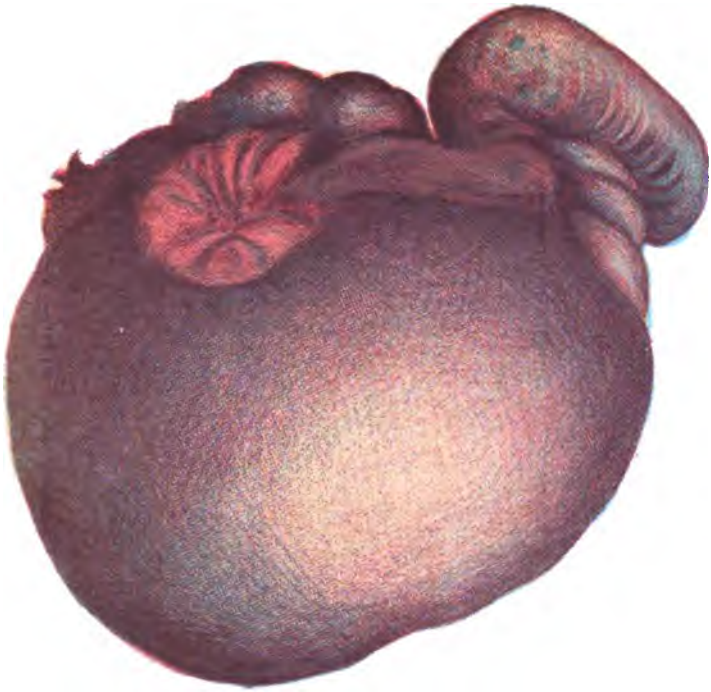
The entire mass—tube, ovary, and hæmatocele—was obviously undergoing necrotic changes. No signs of quite recent peritonitis.

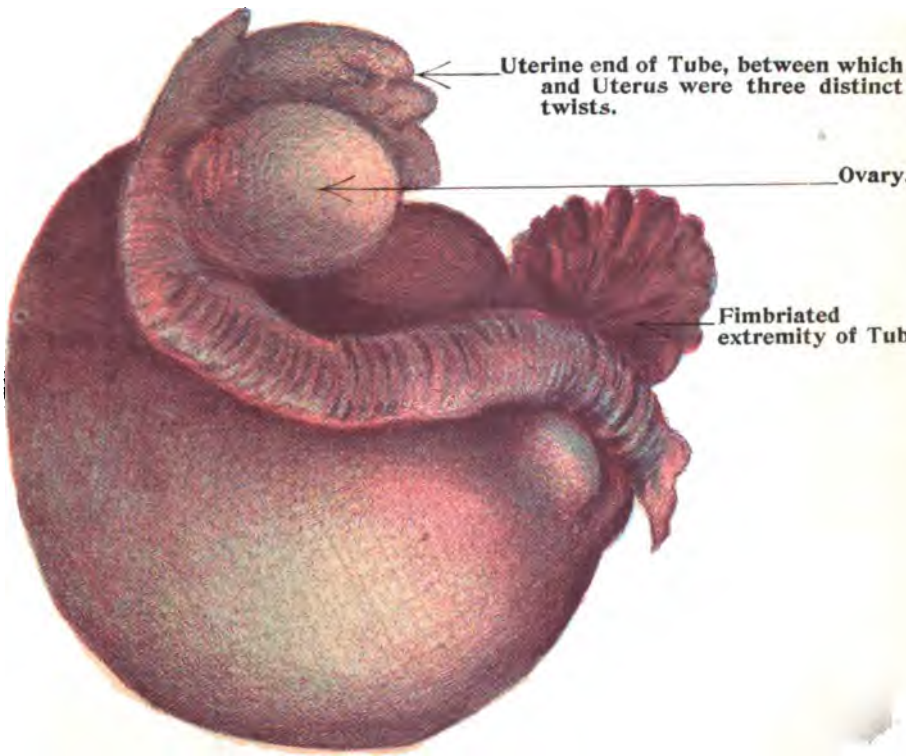
On pathological examination the tube, filled with firm blood clot in its entire length, showed characteristic evidences of a tubal pregnancy—viz., chorionic villi slightly metamorphosed. No decidual cells could, however, be identified, the substance of the tube itself being partly necrotic and infiltrated with blood-pigment.

An incision of the rounded mass (4″ × 3½″) showed that it consisted essentially of an hæmatocele surrounded by peritoneum. In the centre of the blood-clot was a small cavity, apparently lined by membrane, containing about 2 oz. of blood-stained serum. The membranous lining was shown to consist of fibrin, though closely simulating an organised membrane such as the amnion.

Apparently, then, this is an example of an early tubal pregnancy which ruptured and discharged its embryo, with blood, &c., into the broad ligament. Subsequently the early embryo became absorbed so that no trace of it was found on examination.

The twists of the tube were clearly the cause of the necrosis, as also, doubtless, of much of the hæmorrhage. It is noteworthy that no free blood was found in Douglas's pouch, despite the blood-sealed fimbriated end, which might have given rise to a "drip."




Uterine end of Tube, between which and Uterus were three distinct twists.
Ovary.
Fimbriated extremity of Tube.

sections. In suitable cases, however, it will, I am sure, steadily gain in favour. On one occasion the fascia did not come easily together, and excessive strain on it had to be prevented by keeping the patient's legs flexed for a few days. One case alone showed slight indications of a stitch abscess at the extreme end of the incision: the operation was undertaken for the cure of an old ventral hernia. It was impossible to sterilise the skin sufficiently. The woman suffered from a severe bronchial cough of a chronic character, and as a further complication a pneumonic area of dulness developed after the operation. Finally, I may add that the incision does not lend itself well to the employment of an abdominal drainage tube.

Hernial formation is unfortunately a very common sequela of abdominal operations. In no less than six instances I have opened the abdomen within the past four months for the relief of this complication. Of these, two were operations not performed in this country, and one of them was so remarkable that it is worthy of being recorded.

The woman entered the hospital some four weeks ago, suffering from the effects of a former abdominal section performed eight years previously. On the evening of her arrival in hospital, during a fit of coughing her abdomen ruptured, and masses of intestines extruded on to the skin, the pubic hair, and sheets. A full hour elapsed before an operation for her relief could be effected, but notwithstanding, I am happy to say, her recovery has been uneventful.

The prevention of hernia is, I think, entirely dependent on a proper technique being followed in the closing of the abdominal wound, in the accomplishment of which the main objects should be strict asepsis, careful apposition of the more important abdominal layers, and lastly the prevention of subcutaneous hæmorrhage. The attainment

of these ends will always remain doubtful in the practice of those surgeons who employ the through and through suture.

It seems to me a safe precaution to close off the peritoneum in the first instance, which can be very readily accomplished by means of a continuous suture of fine silk. This No. 2 silk is with us antiseptically prepared by being boiled on two occasions, separated by an interval of twenty-four hours, in 1 in 1,000 corrosive sublimate solution. The object sought by such preparation is to render the silk actively inhibitory to the growth of germs, with which of necessity it must come in contact until such time as the phagocytic action of the tissues can exert their full power. Whether the posterior sheaths and recti muscles should be sutured is still a debatable point. For my part I believe such a procedure is not alone unnecessary but positively harmful. The union between muscular structures is proverbially weak, and sutures piercing at right angles to their fibres must impair their vitality by strangulating portions of their vascular and nervous supply.

It is, no doubt, essential to keep the muscles in close apposition, and this can with certainty be done by properly suturing their external sheaths. To attain this end I was formerly in the habit of uniting the sheaths by interrupted sutures of silkworm gut placed in mattress fashion, after the manner advised by Kelly. This proved most satisfactory, and has only now been abandoned by me in favour of the fine continuous suture of silk, for the reason that the latter can be applied more rapidly. The method of suturing above described will almost certainly protect against future hernia, and I need hardly say that in bringing it to your notice I make no claim to originality.

The closure of the skin-wound I have not as yet dealt with, and it is in connection with this that I desire to call

attention to my recently-introduced method which, so far as I know, is novel. I pass a subcutaneous silkworm gut suture immediately beneath the skin in the usual manner, and thread either end through a perforated leaded plate similar to the one I now show. These plates are cut out of ordinary roof lead; in width they measure about two inches, while their length is made to correspond to that of the incision. The lead can be perforated opposite the ingress and egress of the suture by means of a strong surgical needle. Through these the ends of the suture are passed, and, having been drawn taut, are tied together over the plate. The plate should be sterilised, and both it and the skin should be in a perfectly dried state before its application. Aseptic dressings are placed over the plate, and an abdominal binder applied in the usual manner, the parts being left undisturbed for fourteen days. On the expiration of that time the dressings can be removed, and will be practically unstained. The suture is now cut and the leaden plate lifted off. It does not adhere to the skin, but will be found to act after the manner of a smoothing iron in procuring exact apposition of the opposing edges, and preventing over-riding of surfaces. The plate affords a ready means of preventing the suture slackening, and does not permit the wound to pucker. Moreover, I feel convinced that the lead itself exercises a favourable influence on the healing process, for I cannot otherwise account for the perfection of the scar.

CLINICAL REPORT OF THE GYNÆCOLOGICAL DEPARTMENT OF THE ROTUNDA HOSPITAL FOR THE YEAR ENDING NOVEMBER 1, 1903.

By R. D. PUREFOY, M.D. (Univ. Dubl.), F.R.C.S., Master.

[Read in the Section of Obstetrics, May 20, 1904.]

During the year with which this Report deals the number of patients was somewhat smaller than usual. Amongst the cases of exceptional interest were two of inversion of the uterus, both successfully treated—one by amputation and one by reposition; two examples of pancreatic disease, in one of which the symptoms for many days strongly suggested disease of the gall-bladder, and in the other suppuration occurred in a thin-walled cyst; some of the rarer forms of endometritis, including two examples of the variety termed cystic endometritis.

Thanks to the labours of our distinguished Pathologist, Dr. W. C. Neville, I have been enabled to secure illustrations of several of these cases.

Our eight cases of tubal pregnancy all ended in recovery; and in only six of them was laparotomy deemed necessary.

Sarcoma of Uter

Table I.—List of Cases Treated.

Disease	Total	Cured	Relieved	Not Relieved	Died	Remarks
Vulva—						
Vulvitis	8	8	–	–	–	
Epithelioma	1	1	–	–	–	
Eczema	5	5	–	–	–	
Labial cyst	4	4	–	–	–	
Chancroids	1	1	–	–	–	
Labial abscess	1	1	–	–	–	
Perineum—						
Laceration, simple	48	48	–	–	–	
„ complete	5	5	–	–	–	
Urethra and Bladder—						
Caruncle	5	5	–	–	–	
Calculus	1	1	–	–	–	
Cystitis	1	1	–	–	–	
Urethrocele	1	1	–	–	–	
Vagina—						
V. V. fistula	2	1	1	–	–	
Vaginitis	15	15	–	–	–	
Cysts	3	3	–	–	–	
Cystocele	20	20	–	–	–	
Rectocele	15	15	–	–	–	
Ischio-rectal abscess	1	1	–	–	–	
Prolapsed rectum	1	–	1	–	–	
Cervix—						
Polypus	8	8	–	–	–	
Erosions	12	12	–	–	–	
Carcinoma	3	3	–	–	–	
Cysts	7	7	–	–	–	
Hypertrophy	11	11	–	–	–	
Lacerations	28	28	–	–	–	
Corpus Uteri—						
Metritis	1	1	–	–	–	
Endometritis	88	70	–		–	1 membranous, 2 cystic, 1 polypoid
Infantile uterus	1	1	–	–	–	
Incomplete abortion	24	24	–	–	–	
Inversion	2	2	–	–	–	
Carcinoma	9	2	4	3	–	
Sarcoma	1	–	–	–	1	

TABLE I.—LIST OF CASES TREATED.—*con.*

DISEASE	Total	Cured	Relieved	Not Relieved	Died	REMARKS
CORPUS UTERI—*con.*						
Pathological anteflexion	18	18	–	–	–	
Retro-displacement	34	20	14	–	–	
Procidentia	8	7	1	–	–	
„ with pregnancy	1	1	–	–	–	
Fixed retroversion	10	–	–	–	–	
Gravid retroversion	1	7	–	–	–	
Subinvolution	16	16	–	–	–	
Hyperinvolution	1	–	1	–	–	
Pyometra	1	1	–	–	–	
Polypus	4	4	–	–	–	
FALLOPIAN TUBES—						
Pyosalpinx	6	5	–	–	1	In one instance pus escaped through the uterus
Salpingitis	3	–	3	–	–	
Tubal pregnancy	8	8	–	–	–	
OVARIES—						
Cysts	16	16	–	–	–	
Dermoid	2	2	–	–	–	
Parovarian	1	1	–	–	–	
Carcinoma	3	3	–	–	–	
Ovaritis	3	–	3	–	–	
MISCELLANEOUS—						
Hernia	2	2	–	–	–	
Mastitis	1	1	–	–	–	
Cystic kidney	1	–	–	1	–	
Pancreatic cyst	1	1	–	–		
Sapræmia	1	1	–	–	–	
Tubercular peritonitis	1	–	1	–	–	
Perimetritis	13	–	13	–	–	
Parametritis	3	3	–	–	–	
Malignant disease of pancreas	1	–	–	–	1	

VAGINAL HYSTERECTOMY.

CASE I.—A. B., multipara, aged forty-eight. Patient had been in the Rotunda about one year previously suffering from superficial ulceration of cervix, apparently of a benign type, though attended

EXPLANATION OF MICRO-PHOTOGRAPHS.

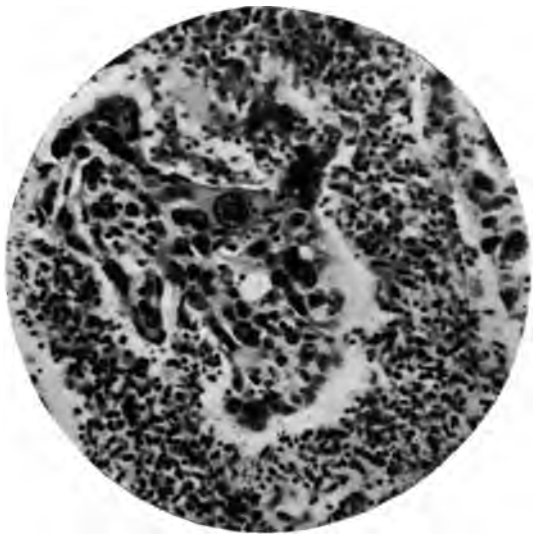
(Micro-photographs by DR. WIGHAM *from preparations of* DR. NEVILLE.*)*

No. 1. (Zeiss' Objective D—Ocular 4).—A markedly atypical squamous-cancer of cervix. (Endothelioma?) The epitumoural cells are of very different sizes—some extremely large. Round-celled infiltration.

No. 2. (Zeiss' Objective A—Ocular 4).—An adeno-carcinoma from fundus of same uterus as in No. 1. Here are seen groups of epithelial-lined tubes which have invaded the muscle fibres.

No. 3. Adeno-carcinoma ("cauliflower excrescence") from uterine mucosa.

Nos. 4-8. (Zeiss' Objective A—Ocular 4).—Various types of glandular endometritis. No. 4 Simplest form; slight excess in number of glands. No. 5 and No. 6 More advanced cases. No. 7 Cystic endometritis; here the glands are much dilated, the section appearing like a piece of lacework to the naked eye; note the preservation of typical epithelium. No. 8. A somewhat rare form of hyperplastic glandular endometritis; the gland spaces are dilated and filled by delicate arborescent branchings of the folded epithelium.



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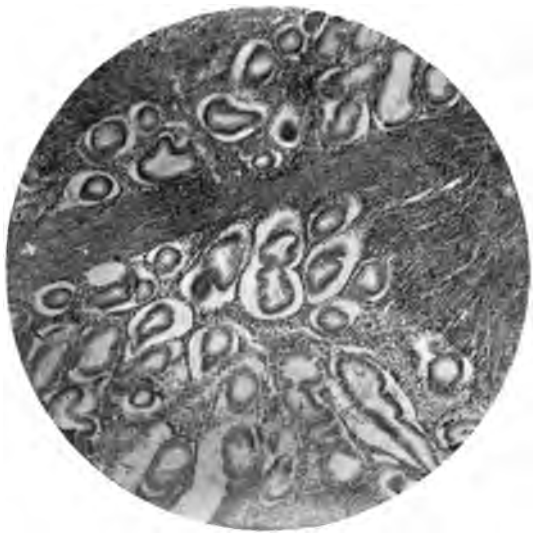

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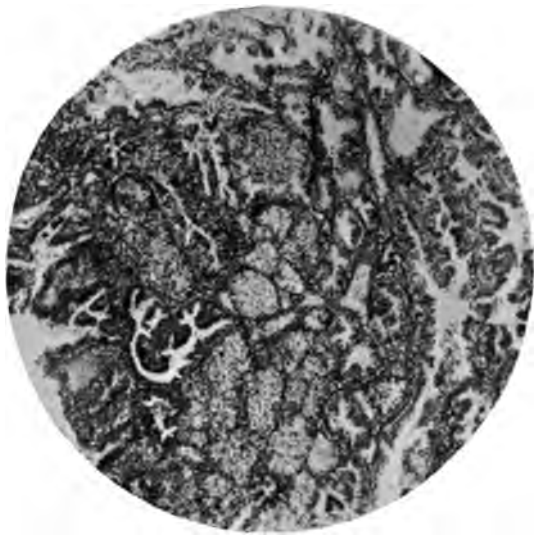

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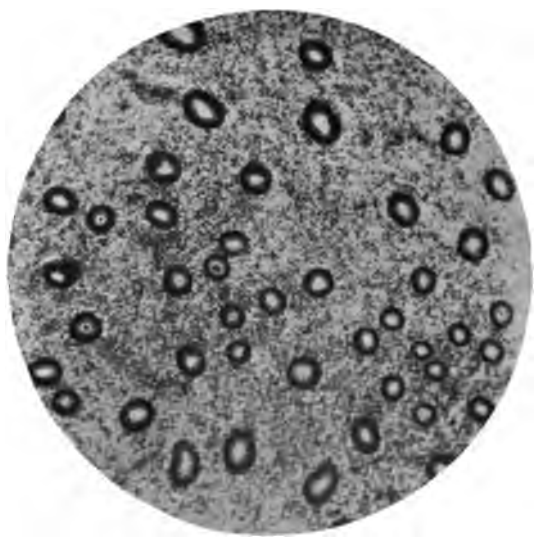

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with unusual pain and loss of general health. Local treatment was followed by such improvement that I believed her complete recovery was simply a question of time, and when leaving the Hospital very little disease was discernible. On re-admission we found that the ulceration had extended so much over the anterior vaginal fornix that radical treatment was obviously necessary; its slow advance, the scanty discharge present, and the continuous distressing pain, recalled the cases formerly described as "Rodent Ulcer." My first step in the proceeding for the removal of the uterus was to sear the diseased surface with the thermo-cautery. Owing to the spread of the ulceration towards the anterior lip, the safe separation of the bladder was a matter of some difficulty; in securing the broad ligaments ligatures were used. For two days after the operation blood-stained fluid escaped from the vagina in considerable quantity. Excellent convalescence.

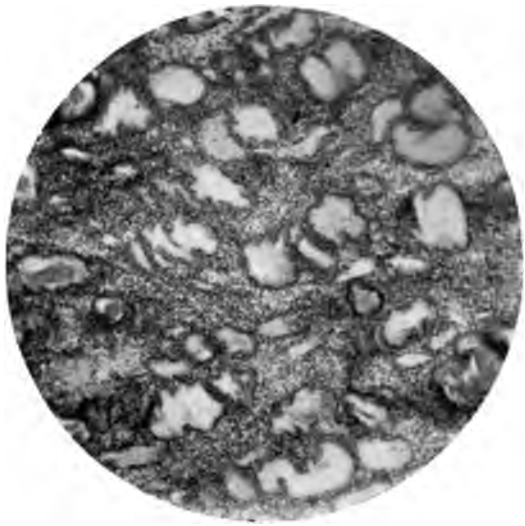
Case II.—M. S., aged sixty-three, multipara, suffering from bleeding and offensive discharge; anterior lip nearly quite destroyed by ulceration; vaginal roof involved. Uterus movable; on passing a curette into it, pus flowed away in considerable quantity. At time of operation I passed strong silk ligatures through edges of os to close it as much as possible, and to serve as a means of drawing down the uterus. I divided the vaginal walls anteriorly and posteriorly with cautery, and secured the broad ligaments with silk ligatures, which were afterwards cut short. Excellent convalescence.

In connection with these cases of malignant disease I desire to add the following notes on a case (E. C., aged thirty-eight, 17 years married) in my Report of last year. Dr. Neville writes:—"This case is specially interesting, as showing two types of malignant disease in the same uterus. Clinically, it was diagnosticated, and correctly so, as a case of squamous carcinoma affecting the cervix and involving the vaginal vault. The appearances of this cervical carcinoma were peculiar, however, in that they closely simulated in some respects those which are found

in syncytioma malignum (*vide* Micro-photograph, No. 1). But the body of the uterus—apparently evenly enlarged to about twice its normal size—was found also to be the seat of an adeno-carcinoma (Micro-photograph, No. 2), in which the glandular tubes, though similar in form to those of the uterine mucosa, were found to own an entirely independent growth." An exact parallel for this case is to be found in the history of H. F., aged fifty-eight, mentioned in my last Report, from which I quote the following:—"The thickened corporeal endometrium is found to consist entirely of a malignant adeno-papillomatous growth, which shows very characteristically the typical form of that cancer. The cervical canal appears healthy; there is nowhere any superficial roughening or loss of substance; but sections through the breadth of the cervical tissue show that here we have an unsuspected—and in no way outwardly evidenced—adeno-carcinoma, occupying the depths of its muscular tissue. The specimen is, therefore, of pathological interest, as presenting two typical forms of cancer: (1) an adeno-papilloma, confined strictly to the endometrium of the body, and (2) an adeno-carcinoma, confined equally strictly to the muscular portion of the cervix."

TABLE II.—OPERATIONS.

Abdominal Fixation	2
Colporrhaphy	30
Colpoperineorrhaphy	12
Emmet's Trachelorrhaphy	19
Schröder's „	13
Removal of Caruncle	5
„ Cervical Polypi	8
„ „ Cysts	7
Posterior Division	11
Perineorrhaphy	53
Panhysterectomy	2



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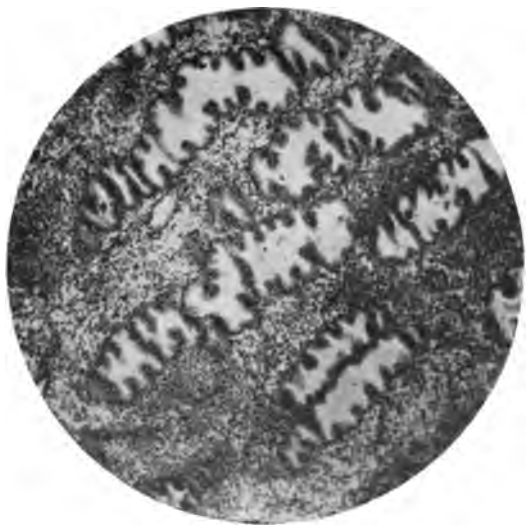

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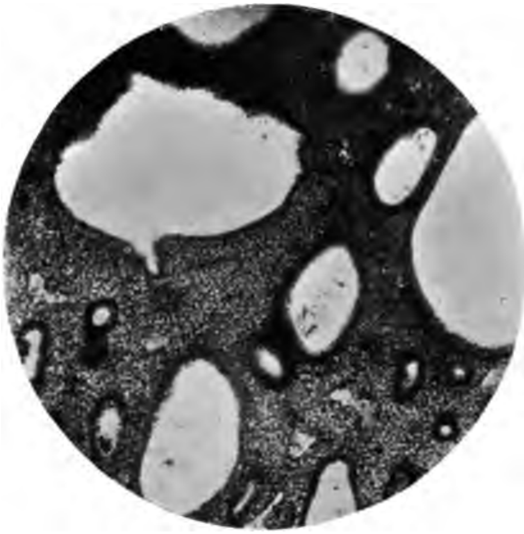

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Table II.—*continued.*

Vaginal Hysterectomy	2
Abdominal „ (for Fibroids)	12
Laparotomy for Tubal Pregnancy	6
Salpingostomy	1
Ovariotomy	18
Salpingo-oöphorectomy	8
Exploratory Laparotomy	7
Vesico-vaginal Fistula	2
Circular Amputation of Cervix	1
Amputation of Uterus for Inversion	1
Reposition „ „ „	1
Herniotomy	2
Colpotomy	2
Cæsarean Section	1
Cystotomy	1
Removal of Calculus	1

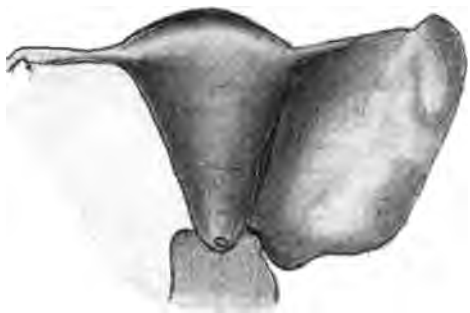
Table III.—Salpingo-oöphorectomy.

No.	Name	Age	Disease	Operation	Result	Remarks
1	A. R.	30	Pyosalpinx	Right	R.	
2	E. J. R.	42	„	„	R.	
3	L. B.	28	„	Left	R.	Tubercular salpingitis. Three years previously underwent laparotomy for ruptured tubal pregnancy
4	S. B.	27	„	„	R.	
5	A. W.	26	„	Double	D.	
6	M. G.	24	Tubo-ovarian abscess	„	R.	
7	M. D.	30	Intralig. cyst and double hæmato-salpinx	Left	R.	
8	M. J. B.	38	Intralig. cyst and salpingitis	„	R.	

Case III.—In the case of L. B., the patient's aspect and condition generally suggested excellent health, and it was with considerable surprise I found what Dr. Neville considered evidence of tubercular disease on both tubes. Both were much contorted, the abdominal ostia closed; the larger swelling on the left side consisted of tube and ovary inseparably bound together. They were removed.

Case IV.—S. B., aged twenty-seven, presents many points of interest. Two years previous to her admission a ruptured tubal pregnancy was diagnosticated, and as it was feared that the accompanying hæmatocele had suppurated, the vaginal wall was incised, giving exit, not to pus, but to a four months' fœtus. Abdominal section was then performed, and the ruptured tube removed. On the present occasion she was suddenly seized with severe pain in belly and faintness, and presented on admission most of the signs and symptoms of peritonitis. In a few days the trouble was at an end, and pulse and temperature were normal. On making a vaginal examination, a tender lump was felt on the left side, which I suspected to be a distended tube. That evening alarming conditions were again present—rigors, faintness, vomiting, and rapid pulse; and on the following day laparotomy was urgently indicated. I made my incision near the old one, and only with much anxious care succeeded in avoiding injury to the coils of intestine which, as I anticipated, were adherent along the old cicatrix. There was ample evidence of intense recent peritonitis, and on separating some adhesions a quantity of turbid fluid and flaky lymph floated up into view. With a little more searching I was able to find a large unruptured pus-tube, which was removed, leaving the corresponding ovary. With a long curved forceps I made an opening in the posterior vaginal fornix, through which a gauze drain was passed into Douglas' space, and finally removed in forty-eight hours. Perfect convalescence followed.

Case V.—A. W., aged twenty-six, had been under our observation for many months. In the beginning double pyosalpinx was easily diagnosticated, but the patient refused operation, especially as the palliative treatment she had undergone had been followed by entire relief from pain and great improvement in her condition in every respect. After several months she returned in a worse condition than ever, and consented to undergo operation. I



Hæmatoma.

Cavity opening into Vagina.

made one unsuccessful attempt to reach the pus by colpotomy, so the next time I chose the abdominal route. The intestinal adhesions on both sides were numerous and dense, especially involving the rectum, but I could not at the time detect the point of communication between the left sac and the intestine, through which pus had leaked into the bowel for some time. I passed a gauze drain from Douglas' space into the vagina, but all my efforts were unavailing to ward off the sepsis of which she died in a few days.

Case VI.—E. J. R., aged forty-two, presented much difficulty in diagnosis, and for some weeks I regarded it as a case of fibroid uterus, complicated with perimetritis. When she had lain some weeks under observation and palliative treatment, a sudden and marked aggravation of all her symptoms led me to open the abdominal cavity. The omentum was widely adherent to the bladder, and when it had been tied and divided a deep red globular mass, elastic to touch, came into view, occupying a mesial position. The uterus was nowhere visible. What looked very like the appendix was connected with the tumour on the right side, but, on examination, this proved to be the right tube, its expanded abdominal extremity lying adherent in Douglas' space. While separating some of the numerous intestinal and omental adhesions which invested the tumour, it gave way, and pus flowed up freely. I immediately applied a ligature to the left broad ligament, and with much difficulty extricated the now collapsed sac from its adhesions in Douglas' space and separated it from the uterus, which had been completely invested by it. The mesosalpinx was tied and divided, the right tube was similarly dealt with and a drainage bag inserted. Recovery was uninterrupted.

TABLE IV.—OVARIOTOMY.

No.	Name	Age	Disease	Operation	Result	REMARKS
1	R. F.	27	Small cyst -	L. side	Recovered	
2	H. L.	33	,, -	Parovarian	,,	
3	A. M.	33	Large malignant tumour of ovary	L. side	,,	Carcinoma. Had been operated on some years ago for pyosalpinx
4	H. F.	25	Small cyst -	,,	,,	
5	A. T.	40	Moderate sized cyst -	,,	,,	Pedicle twisted three times; cyst partially emptied before operation
6	A. G.	68	Parovarian -	,,	,,	
7	R. H.	30	,, -	,,	,,	
8	L. W.	38	Dermoid -	,,	,,	
9	R. G.	32?	Papillomatous -	R. side	,,	Sago-like bodies on parietal peritoneum and intestines
10	M. D.	37	Very large unilocular cyst	,,	,,	
11	L. B.	32	Parovarian -	L. side	,,	
12	A. C.	90	Unilocular cyst -	R. side	,,	
13	F. H.	30	Intraligamentous -	,,	,,	
14	A. R.	35	Dermoid -	,,	,,	
15	M. G.	24	Small cyst -	,,	,,	
16	J. M. P.	44	,, -	,,	,,	
17	M. D.	39	,, -		,,	
18	M. J. B.	—	Small intralig. cyst -	—	,,	

OVARIOTOMY.

Case III.—In the case of A. M., aged thirty-three, the tumour ay so low in the pelvis and so close to uterus that I was unable to determine before operation whether it was uterine or ovarian. This is the fourth case of primary malignant tumour of ovary which has come under my observation. Bland Sutton avers such cases are of great rarity. This patient is at present (Dec. 16) in rude health. In the other instances recurrence was observed in a few months, and in one in a few weeks.

Case V.—A. T., aged forty, had been for some years troubled with attacks of severe pain, attended with vomiting and prostration, and suffered thus a few days before admission. The cyst was small, invested by adhesions between it and the intestines and omentum, and the pedicle was twisted on itself three times.

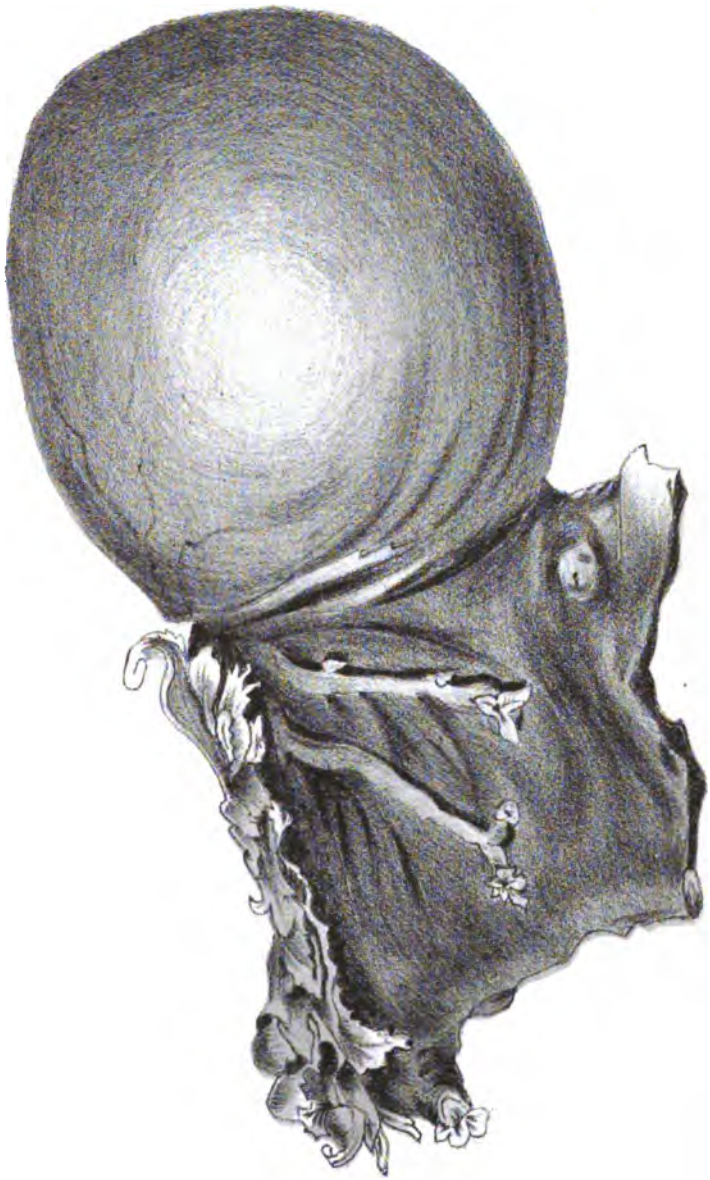
Case IX.—R. G., aged thirty-two, 3-para, was very interesting owing to the difficulty of making a satisfactory diagnosis. Physical signs were :—Vulva and vagina normal; cervix large and soft, lying immediately behind symphysis; uterus thrust forward by a hard mass in Douglas' space, quite fixed. Though the patient's aspect suggested perfect health, I suspected this swelling was a malignant growth. Some hours after being examined, her suffering became so great that I determined to operate the next day. On opening the cœlom the uterus came prominently into view, being pushed up by the mass behind. The latter, however, was so covered over by firmly adherent intestine that I made no attempt to remove it. The left appendages, quite healthy, lay extended considerably above the uterus. The right ovary also lay some distance above the uterus; it was as large as a golf ball, of firm consistence, and studded with warty patches. On the intestines and parietes I observed numerous small, hard, translucent bodies.

Case XIV.—A. R., aged thirty-five, 1-para, was admitted two months after a very difficult labour, suffering from complete perineal laceration; there was also a smooth globular swelling filling up Douglas' space, and elevating the uterus so much that the cervix could not be easily reached. The contents were manifestly fluid, and in order to determine their nature the swelling was aspirated with a hypodermic syringe. As pus cells were present in

abundance, I incised the vaginal wall, giving free exit to the fluid, which presently was shown to come from a dermoid by the presence of a coil of hair. The cyst cavity was washed out and packed with iodoform gauze. In about ten days later I opened the belly, broke down some recent thread-like adhesions, and lifted out the cyst, which was firmly adherent to back of uterus and to the edges of the opening in vaginal wall. Through these I passed two silk ligatures, the ends of which were drawn into the vagina, and in the opening I placed a small drain of iodoform gauze; an excellent recovery ensued, though it was retarded for a few days by either a small localised cellulitis or a hæmatocele.

In last year's Report there is an interesting account of a case in our Maternity in which labour was obstructed by a tumour in the pelvis, which at the time I regarded as a uterine fibroid. When it was pushed out of the pelvis, delivery was easily effected. I allowed the patient home to recruit a little before attempting its removal, but unfortunately she did not return till she was in a moribund condition from suppuration in what proved to be an ovarian dermoid, and general peritonitis. She survived laparotomy and vaginal drainage only two months.

In another similar case, where labour (which took place in the patient's home) was obstructed by a dermoid, a rapidly growing sarcoma developed in the remains of the cyst. In another case, which had been treated in America by posterior colpotomy and drainage, we found on passing a Bozeman catheter into the vaginal openings that some locks of hair were washed out, and the patient was soon able to leave the Hospital quite convalescent. It will always be a difficult point to determine in such cases whether immediate or deferred removal is the safer course to follow; but personally I am in favour of the latter.



Multiple Fallopian Tubes and Parovarian Cyst.

Table V.—Ventral Cœliotomy; Hysterectomy.

No.	Name	Age	Disease	Operation	Result	Remarks
1	M. S.	45	Fibroid reaching to navel	Supravaginal amputation	Recovered	
2	A. M.	34	Sub-serous fibroid	Myomectomy	,,	
3	C. G.	29	Fibroid reaching above navel	Supravaginal amputation	,,	
4	M. T.	39	Fibroid and sarcoma	Panhysterectomy	Died	
5	J. C.	22	Fibroid reaching to navel	Supravaginal amputation	Recovered	
6	M. T.	40	Fibroid reaching nearly to navel	,, ,,	,,	
7	R. H.	42	Fibroid uterus	,, ,,	,,	
8	L. K.	32	,,	,, ,,	,,	
9	S. P.	46	,,	,, ,,	,,	
10	E. H.	42	,,	,, ,,	Died	Died of broncho-pneumonia, of which she had several attacks
11	K. R.	40	,,	,, ,,	Recovered	
12	A. P.	49	,,	Panhysterectomy	,,	
13	M. B.	39	,,	Supravaginal amputation	Died	
14	K. W. (1-para)	29	Fibroid in lower uterine segment	,, ,,	Recovered	Eleven months pregnant

Case I.—In this case a large number of varicose veins in right broad ligament attracted our attention; and when the operation was over a swelling of some size had formed here, and, on pressure, blood flowed from it freely; this was effectually checked by passing a silk ligature through the swelling.

Case II. was jaundiced 48 hours after operation, but her convalescence was uneventful.

Case IV.—M. T., aged thirty-nine, presented many rare points of interest. When first admitted to hospital she was moribund from sepsis; a gangrenous mass, the size and shape of a fœtal head, protruded between labia; her pulse, scarcely to be felt, was 135, her temperature 103.5°, and her aspect generally suggested that no interference could save life. However, I proceeded by morcellation to remove the sloughing tissue and found, when a large portion had been excised, that the growth was a direct continuation of the uterus; this was especially manifest anteriorly where nothing representing a cervix could be made out. A little to the right of the mesian line the glass nozzle of the douche could be introduced behind the pubes to a distance of several inches, but for many days it was impossible to determine whether it entered a greatly elongated vagina or the cervical canal. The tissue removed on this occasion appeared to be that of an ordinary myoma. To our great surprise the patient rallied. During the ensuing four months several similar morcellations were effected, the tissue, however, in these later removals showing plainly sarcomatous characters. Posteriorly for the most part the growth was continuous with the vaginal wall, and any attempt with the finger to separate them disclosed the presence of what might be termed cavernous tissue, traversed by large veins, and bleeding furiously when disturbed. At length I determined, though with little hope of ultimate success, to attempt its entire removal by cœliotomy. The upper portion of the broad ligament on each side was secured without much difficulty, but neither uterine artery could be seen nor felt, though the bleeding was controlled by passing several ligatures with a curved needle in the position usually occupied by the vessels. The uterus was finally transfixed and removed, when it was found that the vaginal canal extended far above the symphysis, and, as had been observed before, the posterior vaginal wall was merged

in the diseased mass. The patient only survived the operation a few days.

Case VII.—R. H., aged forty-two, sought advice because of dragging pain and swelling in left side. In performing supra-vaginal amputation in this instance I left the right ovary and tube; two uterine arteries on each side required ligature. I allowed an interval of a few minutes to elapse between the tightening of the two knots on the silk ligature encircling the cervical stump. The compressibility of uterine tissue renders this a wise procedure.

Case VIII.—In the case of L. K., aged thirty-two, one tube was furnished with a supernumerary ostium, and on both tubes several small growths were observed.

Case X.—E. H., aged forty-two. During the eight years preceding admission had more than once nearly died of broncho-pneumonia, and had troublesome cough at time of admission. She suffered much from abdominal pains, menorrhagia and frequent micturition, and was anxious for operation. The parietes were very thick, and the bladder extended very high up. There was slight elevation of temperature during the first few days after operation, but the pulse was good, and she was able to take abundant nourishment. Towards the end of the week respiration became hurried and laboured, and grew gradually worse, death taking place on the 11th day, evidently from recrudescence of old lung trouble.

Case XII.—A. P., was admitted suffering from complete laceration of perineum, also severe menorrhagia, which two conditions had greatly impaired her health, and her aspect at times was most unfavourable. The perineum and sphincter were restored, and the patient allowed home to recruit her health. In performing the panhysterectomy, it was found impossible to eventrate the uterus till the upper margin of broad ligament on each side had been tied and divided.

TUBAL PREGNANCY.

Case I.—R. O., aged twenty-eight, 2-para, was wanting in many of the signs and symptoms of ectopic gestation, but tubal abortion appeared to me the easiest, if not the most likely, explanation of the cyst containing blood lying in Douglas' space.

CASE II.—M. L., 3-para, after several weeks' amenorrhœa was attacked with hæmorrhage and pain, followed by pain on micturition and defæcation, connected with a considerable swelling behind uterus. At the time of operation the right appendages were found imbedded in this, but the exact site of rupture was not determined.

CASE III.—M. K., aged thirty-seven, 6-para. The uterus lay right in line of incision, thrust forward against parietes, having omentum, which was very redundant, adherent on anterior surface and fundus, thus roofing over a very large mass of coagula. When this was partially removed I had an easy view of a large rupture in right tube, and the ovum, which had escaped from it, lying close by. The tube and ovary (which was very small) were tied and removed. The condition of the left tube interested me considerably; it was very œdematous, but not being otherwise unhealthy, it was not removed.

CASE IV.—E. O'N., aged twenty-five, 2-para, admitted on July 2, 1903. Amenorrhœa since April. Near the end of May began to suffer from pains and bleeding, with attacks of faintness; these troubles are still present, also pain with defæcation and occasional nausea. The belly is very tender, and the uterus is pushed forwards by a soft mass in Douglas' space, reaching two inches above pubes, and everywhere adherent. Operation, July 10. On making incision uterus and appendages were not in view, being pushed to the left by a smooth swelling, lying under and closely adherent to right broad ligament. A large quantity of encysted blood-clot was lifted out of Douglas' space, and with much trouble the tumour connected with broad ligament was detached and tied off at its base; it proved to be a thin-walled cyst, with clear fluid contents. Below it a smaller firm lump was found and shelled out of closely adherent, semi-organised blood-clot. In its outer two-thirds the tube was so incorporated with old adhesions that its outline became unrecognisable. The peritoneum was washed out and dried, the omentum drawn down, and the belly closed.

CASE V.—J. M'P., aged forty-four, 2-para, admitted complaining of pains in belly and back, and in right iliac region. The uterus is erect, and lying in front of it is an elastic mass the size of a Tangerine orange. The case was regarded as a ruptured tubal pregnancy.

Operation, Sept., 23. Parietes very thick; on opening cœlom free blood was observed; firm adhesion between omentum and parietes in middle line, close to bladder; uterus and appendages entirely covered by intestines. Omentum detached with difficulty and intestinal adhesions separated, disclosing on the left side a considerable mass of a greyish-green colour. On the right side the finger could be passed into Douglas' space, which contained fluid blood, and the right ovary was converted into a cyst the size of a thrush's egg. The uterus was incorporated with the posterior surface of the mass situated on the left side, and in trying to lift the latter out of the pelvis, the cyst wall broke in several places, giving exit to a large amount of black coagula. I tied and removed as much as possible of the cyst wall, also the ovarian cyst on right side, and washed out cœlom before closing it. The cyst wall in this instance was undoubtedly the posterior layer of broad ligament; in other words, the extravasation was partially, at any rate, sub-peritoneo-pelvic.

Case VI.—M. R., aged thirty-nine, 1-para, two years since last pregnancy. During the past few weeks patient has had intermittent bleeding, sometimes considerable in amount, attended with pain in lower belly, continuous and sometimes severe. On admission patient complained of weakness, temperature 100.8°; pulse, 115. The os is gaping, uterus enlarged, pushed to the left. Lying on the posterior fornix, extending some distance to the right side, and half way to umbilicus, and a little to the left of mesian line, there is a mass of elastic consistence, which, in places, is tender to the touch. This mass is distinctly larger than it was when the patient was examined two days before admission. It is closely applied to the uterus on the posterior and lateral aspects. Operation, Oct. 5. Parietal peritoneum distinguished with much difficulty, owing to the presence of a layer of blood-clot, immediately underneath, and so adherent to intestines that it could be detached only in places. The uterus was concealed by a large quantity of coagula, and when these were being removed I found an embryo, one and a half inches in length, which had escaped through a rupture in the right tube. Its uterine end was secured, and then the remainder of the tube was tied and removed. The cæcum was adherent to broad ligament, close to outer side of sac. Handfuls of clots were then removed from Douglas' space

and elsewhere; the cœlom was douched, the fluid sponged out, and the wound closed. As no radial pulse could be felt, I injected 25 ounces of saline solution, which restored the pulse in the wrist. The patient had no sickness after the operation, and convalescence was uninterrupted.

INVERSION OF UTERUS.

CASE I.—*Inversion caused by two Fibroids growing from Fundus.*—The patient, K. M., unmarried, aged forty, for three years had suffered from menorrhagia, almost continuous, though variable in amount. Much pain in back and belly was also experienced, aggravated during defæcation, and accompanied by the sensation of a swelling in the vagina. On the 13th of February a large mass, nearly six inches in length, was suddenly extruded from the vagina, and micturition became impossible. Two days later, on her admission to the Rotunda, we found this to be the uterus completely inverted—the endometrium already showing several patches of superficial necrosis, and two fibroids, each the size of a large walnut, projecting from the fundus. The patient's aspect, as well as her pulse and temperature, showed plainly that a dangerous degree of sepsis was already present; while the local conditions were such as to render operative measures full of risk. I determined, in the first instance, to try the effect of liberal diet and stimulants internally; externally antiseptics of various kinds were applied, and a tardy improvement in the condition of the endometrium followed their use. Retention of urine often occurred, requiring the use of the catheter, and a copious offensive vaginal discharge added much to the risk of this proceeding. When some weeks had elapsed sufficient local improvement was observable to warrant an attempt for the removal of the uterus, which was carried out as follows:—I encircled the organ at a point where the endometrium was healthy with a few turns of an elastic ligature, and at a short distance below this made a circular amputation in such manner that the cut surface was somewhat concave. The incision passed through the cervix a little below the os internum. Numerous silk ligatures were then passed; first, one running in purse-string fashion around the canal, and then several in a radiating direction from within outwards. When the elastic ligature was loosened several other bleeding points, including a couple of vessels, were separately

Prolapse of Gravid Uterus.

tied. Convalescence, as might be expected, was slow, but entirely satisfactory; and I observed with much interest a few weeks afterwards that the remaining portion of cervix became re-inverted, allowing the original os externum again to appear in the vagina.

It will be remembered that in the cases reported by the late Dr. Denham, and by Spiegelberg, the same incident was observed.

In the *Dublin Medical Journal*, 1866, Dr. Denham writes:—"A primipara, aged twenty-three, suffered inversion from pulling on the cord and pressure on the fundus uteri. She was admitted to the Hospital eleven days afterwards. Under steady pressure the uterus gradually diminished, and was felt to yield, so that the fundus alone remained unreduced; no amount of force, compatible with the safety of the organ, could enable us to complete the operation. On the third morning we were agreeably surprised to find that the fundus had spontaneously returned."

In Spiegelberg's case efforts at replacement were tried with partial success, but were interrupted by an attack of diarrhœa. A fortnight later examination showed that in the interval complete reduction had taken place.

Case II.—*Inversion, complicating Childbed, in a Case where Manual Removal of the Placenta had been found necessary.*—In April, 1903, a primipara, aged twenty-five, was admitted to the Auxiliary Ward suffering from metrorrhagia. Her pregnancy had terminated somewhat precipitately five weeks previously, and a midwife, who was in attendance, had removed the placenta manually. A physician arrived shortly afterwards, and finding the uterus inverted, replaced it, as he believed. At the time of her admission to Hospital her anæmic aspect testified to the loss of blood in considerable quantity, and the local signs and conditions rendered the diagnosis of inversion a very easy matter. I specially noticed that, so complete was the inversion, only a very narrow rim of cervix could be felt. When her strength had been somewhat restored by rest, food and tonics, I proceeded

to attempt reposition in the manner which proved successful in a similar case narrated in a former Report. Four bullet forceps were inserted at equi-distant points in the very narrow rim of the cervix, and my repositor was applied to the fundus; at the same time an assistant kept a hand firmly placed on the parietes. Our efforts for a few minutes did not appear to avail much, especially as a bullet forceps now and then lost its hold on the slender portion of the cervix which was within reach, and its re-adjustment was sometimes difficult; but steady perseverance in the details already mentioned, aided by the application of the fingers to the sides of the uterus, effected the complete replacement of the fundus in about twenty minutes. A gauze drain was placed in the uterine cavity and left there till next day. Convalescence was in every respect satisfactory, and on measuring the uterus just before patient left the Hospital the cavity was something less than two and a half inches.

These two cases may be profitably considered in connection with two similar ones recorded in a former Report; like them they illustrate the two commonest causes of this most serious uterine displacement—viz., the presence of a polypus springing from the fundus and injudicious management of the third stage. In the former case the propriety of amputating the organ can seldom be questioned, though the proceeding is by no means free from risk, and one of my patients had considerable pyrexia for some days. In the latter case the possibility of replacement should be seriously considered; and the number and variety of operations and mechanical devices which have been described show how much attention has been given to the matter. In my opinion sufficient attention has not been given to the importance of fixing the cervix before applying pressure to the fundus, and our success in the above-noted cases appeared to be mainly attributable to this detail.

EXPLORATORY LAPAROTOMY.

Case I.—J. B., aged thirty-two. Patient states that at one period each menstruation was attended by the passage of a

"fleshy membrane," and that this continued for three years and then ceased. Very numerous firm adhesions, concealing the uterus and left appendages; right tube much thickened and inseparably united with cystic ovary on same side. Owing to firmness of adhesions removal was not attempted. Patient improved.

Case II.—M. C., aged twenty-three, suffering with fixed retroversion. Slightest attempt to move uterus followed by severe pain. Some hours after examination rigors, vomiting and elevation of temperature; laparotomy deemed advisable. Ample evidence of recent peritonitis; flaky lymph at various points on intestine; also on fundus, to which right tube was adherent by abdominal end. Cœlom washed out; uterus brought into position and wound closed; perfect convalescence; uterus in normal position.

Case III.—K. D., aged fifty. Patient suffering from offensive watery, discoloured discharge; much pain. Uterus enlarged and irregular; cavity four and a half inches. Curette removed large quantity of soft, greyish matter, attended with free bleeding. Laparotomy revealed the presence, on the left side, of a large deep-red tumour, lying beside uterus, arising by a broad base from pelvic brim, and involving sigmoid flexure. Inoperable. Some months subsequently patient writes saying she is troubled with flatulence, but not making any other complaint.

Case IV.—M. B., aged forty-four. Fibroid uterus reaching nearly to navel. Incision in usual position led directly into bladder, which extended upwards nearly as high as navel. Opening in bladder closed with catgut, and parietal incision in usual manner with silkworm gut. Operation followed by relief to bladder trouble, which patient had before experienced.

Case V.—Patient, S. F., aged twenty-four, admitted moribund. History of obscure typhoid symptoms lasting for some days before admission. Incision gave exit to fœtid gas and quarts of bowel matter. Extraordinary improvement for three days, when patient suddenly expired.

Case VI.—S. O'B., aged thirty-six, nullipara, admitted on account of a small pelvic tumour lying close to uterus, but, I think, more probably ovarian than uterine. Patient had, on

more than one occasion, suffered from severe attacks of vomiting, but at time of admission did not appear ill, and is well nourished. On Nov. 4 patient had several attacks of severe pain, followed by bilious vomiting. Pain referred to epigastrium and also to the right side, extending back towards scapula. On the 6th her condition was so much worse, owing to continued vomiting and pain, that I performed an exploratory laparotomy in the epigastrium. The tissues in abdominal wall were deeply bile-stained, and the viscera so universally adherent that exploration was most difficult. In separating deep adhesions blood was found extravasated in considerable quantity; the head of the pancreas was indurated and much enlarged. No perforation of stomach or gall-bladder could be found. The patient died twelve hours after the operation.

ABDOMINAL FIXATION.

CASE I.—E. B., aged thirty-two; childless; marked hypertrophy of cervix, which protruded from vulva. Uterine body small. Circular amputation of cervix, followed by abdominal fixation.

CASE II.—A. C., aged eighty. Complete procidentia uteri, accompanying an ovarian cyst. When ovariotomy was performed, abdominal fixation was also secured by passing two of the abdominal stitches through anterior surface of uterus.

SPLENIC ABSCESS.

E. M., aged twenty-four, 1-para, admitted July, 1903; had been confined ten weeks previously, and was in bed for fifteen days, probably owing to some pyrexia. When out walking about four weeks after confinement she was seized with severe abdominal pain, and remained very ill for some weeks, when she was sent to the Rotunda from Athlone. Her prostration was such that it was feared she would not survive the journey to Dublin. Her pulse was so feeble that I could not count it; extreme emaciation had occurred; the belly manifestly contained fluid, encysted, situated between epigastrium and navel; lower down the belly is flat, and two doughy swellings are noticeable. I regarded the condition as due to tubercular peritonitis. Under treatment, chiefly symptomatic, slow but steady improvement was observable, and coincident with this all evidence of fluid in the belly dis-

appeared. After a few weeks, however, the temperature, which had become normal, began to show marked evening elevation, and some rigidity of the abdominal wall below the navel being observable, I determined to make an exploratory incision in this region. The parietes were very tense and vascular, and peritoneum undistinguishable. Presently very stinking pus began to flow in considerable quantity from a cyst, or space shut in by very thin walls. This was washed out, and a gauze drain inserted. Slow but satisfactory convalescence ensued.

It will be seen that, though this trouble originated in or shortly after childbed, the situation of the pus and some other points in the history suggest that there was suppuration in a pancreatic cyst.

A CASE OF TUBO-OVARIAN CYST.

By GORDON W. FITZGERALD, M.D. (EDIN.), L.R.C.P.I.;
Senior Assistant Master, Rotunda Hospital, Dublin.

[Read in the Section of Obstetrics.]

I DESIRE to express my gratitude and indebtedness to the Master of the Rotunda for kindly allowing me to perform this and many other major operations in the hospital and for sanctioning my reading this paper on the subject of one of them.

The specimen which I show was removed from a woman whose abdomen I opened with the primary object of performing a ventral fixation for the cure of an old-standing retroversion of the uterus. I bring the specimen before the Academy for the reason that recorded cases of true tubo-ovarian cysts are distinctly rare, however many may be seen by the gynæcologist.

The patient is aged thirty-six. She has been pregnant ten times and went on to full time pregnancy in seven of these. The three other pregnancies all terminated at about the third month.

She complained when I first saw her, in the dispensary, of a feeling of weight in the pelvis, with pain in the lumbar and sacral regions of the back. Her menstruation was irregular, the duration three to five days, and the amount not excessive. Occasionally the pain during menstruation was extreme. She had a constant leucorrhœal discharge, which was never on any occasion watery.

On vaginal examination the uterus was found to be retroverted and held back by numerous adhesions. The posterior ligaments were exceedingly tender. When the patient was anæsthetised there was felt, lying high up and to the right of the uterus and somewhat posterior to it, what was diagnosed to be a distended and tortuous tube. Her temperature during the few days that she was under observation in hospital previous to operation

showed no variation at all from the normal, nor was there any acute pain during this time.

The diagnosis made was retroversion, with adhesions and a distended right tube.

On 16th February I opened the abdomen by a transverse incision in the skin and fascia, the recti being separated and the peritoneum divided longitudinally, after the method which the Master (Dr. E. H. Tweedy) has described in his paper.[a] The uterus was found to be retroverted and held back by numerous adhesions, during the breaking down of which there was smart hæmorrhage. This specimen, which I show, was found to be the left ovary and tube, much distended, as you see. The tube as it left the uterus was coiled and twisted on to the posterior surface of the uterus, and lay with its ovary in greater part to the right side of the uterus. Numerous and firm adhesions were broken down during the removal.

As you will observe on examining the specimen the tube is tortuous and distended, while its fimbriated end looks upwards. About the juncture of the outer and middle thirds of the tube you will observe there exists a direct communication between this distended portion and the cystic portion of the ovary. The uterine third of the tube you see shows no distention at all. The cystic portion of the ovary lies entirely between the folds of the broad ligament, and doubtless by pressure on the wall of the tube has gradually forced a communication—or, as is described as more common, the primary condition may have been a sactosalpinx. The condition with which we may confound it—and indeed, apart from tubo-ovarian abscess, the only one—is ovarian hydrocele. This last condition, however, leads to little, if any, distention of the tube. In it the communication exists between the abdominal end of the tube and the ovarian sac, and, further, there is frequently an intermitting discharge of fluid from the tube and so from the uterus. The discharge I made particular inquiries about, and could get no history of its occurrence

[a] See page 255, *ante*.

at all. In tubo-ovarian cysts there is usually some pre-existing salpingitis, as there would seem from the numerous adhesions to have been in this case, while in ovarian hydrocele no such condition exists.

The specimen was carefully examined by Dr. Neville, the pathologist of the hospital, and he is of opinion that it is distinctly a tubo-ovarian cyst.

After removing the specimen I show, I fixed the uterus to the anterior abdominal wall, according to the method described by Kelly.

The convalescence of the patient was quite uneventful. I have seen her recently, three months after operation, and she is perfectly comfortable, being quite relieved of all her symptoms.

SECTION OF PATHOLOGY.

THE CYTOLOGY OF SEROUS AND SEROFIBRINOUS EFFUSIONS OF THE PLEURAL AND OTHER SEROUS CAVITIES, AND OF THE CEREBRO-SPINAL FLUID.

By H. C. EARL, M.D., F.R.C.P.I.

[Presidential Address delivered in the Section of Pathology, Nov. 6, 1903.]

I MUST first express my thanks to the Fellows of the Academy for having elected me President of the Section of Pathology. It has been the custom for the President at the opening meeting to deliver an Address, and I propose to follow this custom, and to address you on the cytology of serous and serofibrinous effusions of the pleural and other cavities. The systematic examination of the cellular contents of these fluids has been much practised during the past three years, and many communications appear in medical literature on the subject. I have had myself some experience of these examinations, and the results I have obtained are in general accord with those obtained by most of those who have written on the subject. These results are extremely interesting, and some of them appear to me to be of considerable clinical value, especially in the diagnosis of tubercular affections. I have, therefore, thought that a short account of the methods of examination and of the results obtained might be of interest to the Royal Academy of Medicine.

It will be admitted, I think, that chemical and bacterio-

logical examinations of serous effusions often fail to give results on which an opinion as to their ætiology can with any certainty be based. Even this distinction of exudations from transudations by the chemical characters of the fluid is liable to fallacies. Exudations have generally a specific gravity higher than 1018, and transudations one lower than 1018; but the specific gravity of many exudations and transudations so closely approaches 1018 that it becomes difficult to draw any conclusion.

Again, with regard to the reaction of these fluids, exudations are, no doubt, generally acid, transudations alkaline; but it is found that with phenol-phthalein as indicator both have an acid reaction, while with litmus as indicator some fluids that are certainly exudations have an alkaline reaction.

Bacteriological examinations are in many cases useful, and organisms such as pneumococci, typhoid bacilli, or others, may be found, but many of these effusions are sterile. Tubercle bacilli are rarely if ever found in serous effusions, even when they have a tubercular basis. It is taught by many that every pleural effusion which is free from micro-organisms ought to be considered tubercular. This is quite too absolute a statement, for when successive examinations have been made of fluid from the same case different results have been got at different times.

Thus at an early stage micro-organisms (pneumococci, for instance) have been found which were easily recognised by the microscope and by culture; at a later stage micro-organisms could be recognised by the microscope in a morphologically altered condition, but could not be grown on culture media, and after a further interval of time no micro-organism could be found, even by the microscope. It is clear then that an effusion caused originally by a micro-organism may become after a time free from micro-

organisms. Michaelis has, moreover, shown that in some undoubtedly tubercular effusions other organisms occur.

The examinations made of the cellular elements of effusions have been till recently chiefly carried out in cases of effusion suspected to be caused by cancer of the serous membranes. In many of these cases cancer cells are not found, but they are certainly occasionally present, though there is much difference of opinion as to the ease with which they may be recognised. Some authors—Wolff among the number—point out that endothelial cells so alter as to take on all sorts of shapes, and may become then very difficult to distinguish from cancer cells, while others consider the recognition of the latter very easy.

There are two points which are worthy of attention as an assistance in the recognition of cancer cells:—

1. Quincke has pointed out that cancer cells frequently contain glycogen (or, at least, an iodophile substance), which is very rarely present in endothelial cells.

2. Mitotic nuclei are frequently found in cancer cells, but are said not to be found at all in shed endothelium.

Widal and Ravaut in Paris and Alfred Wolff in Berlin share the merit of having first systematically applied to pleural effusions the methods so long and so commonly adopted, and with such good results, in the examination of the blood.

The first results of their investigations on the cyto-diagnosis of pleural effusions were published by Widal and Ravaut[a] in June, 1900, and since that time numerous papers have appeared, chiefly in France, but also in other countries, on the cells of pleural and other effusions and of cerebro-spinal fluid.

The diagnosis of tubercular effusions of the pleura has

[a] Widal and Ravaut. Applications cliniques de l'Étude Histol. des Epanchments. Comptes rendus de la Soc. Biol. 1900.

been a matter of great difficulty. (No doubt many effusions which were at one time considered rheumatic or idiopathic were really tubercular. Landouzy, who based his conclusions on the results of *post-mortem* examinations, considered that 98 per cent. of primary effusions were tubercular, and others gave a general confirmation to his view. It must, however, be remembered that only the least favourable of these cases would be available for *post-mortem* examination, and, therefore, the percentages arrived at by Landouzy and others were almost certainly too high.) I have already pointed out that the absence of micro-organisms from an effusion is not sufficient to stamp it as of tubercular origin, and that tubercle bacilli are rarely found in serous effusions. If sputum is present in such cases it is not likely to render any assistance, as it does not contain tubercle bacilli. No doubt inoculations of animals are more reliable, but the time that must elapse before a result is obtained is considerable, and they are not always available. What I have stated with regard to the difficulty of recognising the tubercular nature of effusions into the pleural cavity applies generally to effusions into other serous cavities.

It would, therefore, then be a great advantage if from the cytological character of an effusion it were possible to say whether it was of tubercular origin or not. It appears from the results of cytological examinations that in the case of pleural effusions this is possible.

Widal and Ravaut, from their examinations of serous effusions of the pleura, conclude that the different varieties of cells that occur in these fluids occur in proportions that vary with the nature of the effusion; that there is, in fact, a certain cytological formula corresponding to each variety; and that from a knowledge of its cytological formula the nature of an effusion may be concluded.

According to them a predominance of lymphocytes denotes a tubercular effusion, a predominance of polynuclear cells an acute infectious effusion, while mechanical effusions are characterised by a predominance of endothelial cells.

Wolff[a] concludes that it is possible from the morphological characters of a pleural effusion to draw conclusions as to its ætiology; that where half or more of its cells are lymphocytes the effusion is tubercular; and that in acute infectious effusions the cells are polynuclear leucocytes.

These formulæ of Widal and Ravaut and the conclusions of Wolff then agree in the main, and have received general assent as to their essentials, though certain variations have been made necessary by subsequent researches.

Widal and Ravaut attempted further to maintain that their cytological formulæ also held good in the case of cerebro-spinal fluid, pericardial and peritoneal effusions, and to effusions into the tunica vaginalis and into joints. In these fluids, however, the results obtained by cytological examination, though generally agreeing with Widal and Ravaut's formulæ, are not so consistent as they are in the case of fluid from the pleura.

Before considering in detail the effusions into different serous cavities it is necessary to give a short description of the methods employed in investigating their cell contents.

The fluid having been obtained with aseptic precautions, the cells are collected by centrifuging. This is best done immediately the fluid is obtained, as many of these fluids coagulate spontaneously. Coagulation may be prevented by the addition of sodium citrate solution, or the process of centrifuging may be deferred until the fluid has been defibrinated. This may be effected in a few minutes by shaking the fluid up with small glass spheres. It is better

[a] Wolff. Morphologie der Pleuralergüsse. Berliner klin. Wochensch. 1901 and 1902.

to use, if possible, fluid that has not coagulated, as our knowledge of the process of coagulation is not sufficient to enable us to say how far the cells are destroyed during its occurrence. Even if coagulation has already occurred it is still possible to use the fluid for cytological examination after first shaking it up with small glass spheres to break up the coagulum and set free the cells it contains. It is probable that any loss of cells that takes place during coagulation is not material.

Centrifuging for two minutes usually obtains a sufficient deposit, which adheres to the end of the centrifuge tube, so that nearly all the supernatant fluid can be poured off without disturbing it. From the deposit, mixed with the small amount of fluid that remains, films are made. This is done by spreading some of the mixture on slides or cover glasses and allowing it to dry in the air. For the easier recognition of the cells in doubtful cases it is better to make a layer of capillary thinness, as is done in blood films. This spreads out the cell and allows its characters to come to view, but naturally the preparations made in this way contain fewer cells, and so more preparations are necessary for the subsequent counting. When the fluid is highly albuminous the dried film stains so deeply in eosin and other dyes that the details of the cells are obscured. This defect can be obviated by replacing the fluid poured off after centrifuging by normal saline solution, shaking this up with the deposit and again centrifuging (and, if necessary, repeating this process), so that the cells forming the deposit come to be surrounded by a fluid containing little albumen. Substitution of the albuminous fluid by normal saline solution is not always necessary, and should be avoided in cases where the presence of glycogen is to be determined. Fixing is done by alcohol and ether, formol alcohol, or other method, as in the case of blood films.

The stains chiefly used are—Hæmatoxylin and eosin; methylene blue and eosin; Romanowsky stain, in one or other of its modifications; methyl-green and pyronin, as recommended by Pappenheim; and the triacid stain of Ehrlich.

The triacid stain is not of such general use as it is in the case of blood films, because the neutrophile granules are often altered so as to lose their power of taking up stains. It will be remembered that these are the most labile part of the cell, and even in blood preparations, when they are badly fixed, fail to stain.

It is often of advantage, and sometimes necessary, to use two or more staining methods. The counting is done as in blood films.

The cells that may occur in effusions, other than cancer cells, are—Red blood corpuscles; polynuclear cells; mononuclear cells, chiefly small lymphocytes; and endothelial cells.

Of these, red corpuscles are of no importance in cytology; mast cells are rarely found (though in one case they were 10 per cent. of the total cells), and are of no diagnostic value. Eosinophile cells are more often found, and in some few cases have formed a considerable percentage of the total cells, but the cases where this occurred were so very various in their nature that no conclusion can be drawn from their occurrence, and for our purpose they may be left out of account. The lymphocytes, polynuclear neutrophile cells and endothelial cells are all of importance.

The recognition of the different varieties of cells in blood films is very easy, but in films made from effusions it is often very difficult. This difference is due to the fact that, while in blood we meet generally with no degenerate cells, in serous effusions some of the cells undergo such changes

as render them liable to be mistaken for cells of a different class. It is necessary to describe some of the more important degenerative forms, as obviously failure to recognise their existence may make important differences in the results obtained. Indeed, it is probable that some of the discordant results obtained may be thus accounted for.

The polynuclear neutrophile cells are liable to undergo two changes, in both cases with the result that they appear mononuclear:—

1. The different segments of the nucleus may swell, and may come to lie so close together that the nucleus appears to be a single rounded mass. On careful focusing, however, a space can be made out separating the different segments.

2. The nucleus may break up into rounded fragments. This division is followed by division of the protoplasm, so that each portion of the nucleus becomes surrounded by a layer of protoplasm.

Ehrlich first described these bodies in an exudation in puerperal sepsis, and called them "pseudo-lymphocytes." He described them as "about as large as a small lymphocyte, having a rounded nucleus which stains deeply, and a narrow layer of protoplasm containing neutrophile granules." He considered them rare, but Wolff has found them not uncommon in pleural effusions. When the neutrophile granules can be stained in these two degenerate forms of neutrophile cell no difficulty in their recognition can arise, but when, as is frequently the case, staining cannot be accomplished their recognition is a matter of difficulty, and hence their distinction from lymphocytes needs special care.

The following points will assist in distinguishing pseudo-lymphocytes from lymphocytes:—

1. Neutrophile granules may be found in them.

2. Their zone of protoplasm is generally wider than that of lymphocytes.

3. They are naturally more common in effusions of a polynuclear character. This would probably prevent a mistake occurring, as only a few of them are likely to be mistaken for lymphocytes by anyone of experience.

4. When stained with methyl-green pyronin their protoplasm only takes on a light rose colour, while that of lymphocytes stains a deep red.

The changes in endothelial cells are of less importance than those in polynuclear neutrophiles. Their nuclei may swell and come to lie excentrically, and they may resemble large mononuclear cells of the blood, but are always too large to be mistaken for lymphocytes.

According to Patella,[a] however, what other observers describe as lymphocytes are really degenerate forms of endothelial cells. The change of the large, faintly-staining nucleus of the latter to a smaller and, on account of the condensation of the chromatin, more deeply staining nucleus, with simultaneous solution and disappearance of the protoplasm of the endothelial cells, he states he has even observed in vitro. Even allowing the possibility of such an occurrence, as Tarchetti and Rossi point out, it is certainly not the rule. If it were, we should expect to find it in tubercular exudations, for it is in tubercular cases that lymphocytes are generally found in the early stage solely endothelial cells; but this, as we shall presently see, is not at all the case.

I shall now refer in more detail to the results obtained in different effusions, and I shall first speak of effusions into the pleural cavity, as in these the results have been

[a] V. Patella. Ueber Cystodiagnostic der Ex-und Transudate. Deutsche med. Wochenschrift. 1902.

most consistent. I have already stated that as the result of their cytological researches of pleural effusions, which were controlled by inoculations, tuberculin injections, and all other available ways, Widal and Ravaut arrived at certain conclusions, and that these conclusions received general confirmation from the researches of others.

In primary tubercular effusions, Widal and Ravaut found of nucleated cells, lymphocytes almost exclusively, with a more or less considerable number of red corpuscles. Occasionally they found a few cells which were neither large mononuclear cells or altered endothelial cells. They never found large flakes of endothelium, but they considered it not improbable that these might be found at a very early stage of the affection. Polynuclear leucocytes were always less than 10 per cent.

It appears, however, from the observations of Wolff, and of Barjon and Cade, that the cells found vary greatly, such variation depending on the time, after the commencement of the attack, at which the fluid was taken.

Wolff describes the cells of tubercular effusions as being, in typical cases, nearly all lymphocytes, but states that polynuclear leucocytes are sometimes present in such numbers as to form a quarter to one-third of the total cells. In these latter cases he found at a subsequent examination a complete disappearance of polynuclear cells. He also observed that in several cases which clinically seemed probably tubercular, and which contained morphologically altered micro-organisms, the fluid contained nothing but polynuclear cells. In the course of a few days the fluid was examined again, and it was found that the polynuclear cells formed only one-third of the total cells, and at a subsequent examination no polynuclear cells were found, but only lymphocytes.

Barjon and Cade mention a case where the fluid, three

days after the beginning of the attack, contained 68 per cent. of polynuclear cells and 30 per cent. of lymphocytes; six days after this the fluid contained 6 per cent. of polynuclear cells and 80 per cent. of lymphocytes. They also found that endothelial cells are often present in the early stage, and are sometimes numerous. In one case endothelial cells formed 60 per cent. of the total cells. These endothelial cells diminish very soon, and finally disappear. This variation of Widal and Ravaut's formula for tubercular effusions is to be explained by the fact that in the early stage, before a fibrinous membrane covers the pleura, desquamation easily occurs. When, however, the membrane is formed desquamation ceases, and the desquamated cells disappear by the action of the fluid in which they float.

It may be stated that polynuclear cells are always present in the early stage—about 10 days—of pleural effusions of a tubercular nature. The earlier the case and the more acute the onset the more numerous they are. Their cytological formula may, therefore, be that of an acute infectious effusion, and before having faith in Widal and Ravaut's cytological law it is necessary to know the date of onset. During the first ten days, and particularly during the first five days, a second examination is usually necessary.

The cytological formula of secondary pleural effusions—*i.e.*, those coming on in the course of phthisis—is sometimes the same as that of primary cases, but generally the cell formula is very mixed. This has been attributed to mixed infection.

Acute infectious effusions are all characterised by a predominance of polynuclear leucocytes.

In exudations due to pneumococci the cells are at all periods mainly polynuclear, but there may be a consider-

able quantity of endothelium in the early stage. Exudations due to streptococci are practically the same as regards their cells as those due to pneumococci.

In exudations due to the typhoid bacillus the polynuclear leucocytes are also the predominant elements, but they are relatively less numerous than in pneumo- or strepto-coccal exudations. Generally they constitute 50 to 80 per cent. of the total cells, the remainder being lymphocytes and endothelial cells.

In true rheumatic pleural exudations—that is, those which come on in the course of articular rheumatism—the cells found are chiefly polynuclear, a good many endothelial cells, some red corpuscles, pseudo-lymphocytes, and a few lymphocytes.

In mechanical effusions—*i.e.*, those coming on due to cardiac weakness or renal disease—in the early stages there are numerous large flakes of endothelium, with some polynuclear cells and lymphocytes in variable number. The endothelial cells, when the effusion is older, undergo alterations and disappear. When an infarction occurs with an effusion polynuclear cells are numerous.

So far, then, as observations have gone on serous effusions of the pleura Widal and Ravaut's formulæ have received much confirmation. Variations from the formulæ occur, but we are acquainted with the circumstances on which the variations depend. Particularly with regard to the value of a lymphocytic formula as diagnostic of tubercular effusions, there appears to be no real difference of opinion, and it is considered by many to be a most reliable sign of the tubercular nature of an effusion.

Few results of the examination of pericardial fluids have been recorded, most of them being in accordance with Widal and Ravaut's formulæ. Rendu found predominance of lymphocytes in a case of tubercular pericarditis.

Dopter and Tanton in a similar case found chiefly lymphocytes with a few polynuclear cells, and endothelial cells in great numbers. Weill, in a case of pericardial effusion, which was preceded by articular rheumatism, and which was supposed to be rheumatic, examined the fluid obtained *post-mortem* and found predominance of lymphocytes, and the case proved to be tubercular. In one case, where I myself examined serous fluid obtained *post-mortem* from a case of tubercular effusion, I found nearly 70 per cent. of lymphocytes.

Barjon and Cade, on the other hand, in a case where both pleural and pericardial effusions of a tubercular origin were present, while they found only 6 per cent. of polynuclear cells in the pleural effusion, the rest being mainly lymphocytes, found in the pericardial fluid 97 per cent. of polynuclear cells. Whether this could be attributed to the pericardial fluid being of more recent origin than the pleural is not stated. The number of cases examined is not sufficient to warrant any conclusion.

In peritoneal effusions, some observers have found a lymphocyte predominance in tubercular affections, others have found, what we have seen in pleural effusions, at first a predominance of polynuclear, but later on a predominance of lymphocytes.

In ascites due to cirrhosis of the liver chiefly endothelial cells, with more polynuclear cells than lymphocytes, have been found, but there are a good many discordant results, and further observations are necessary.

Widal and Ravaut applied their formulæ also to effusions in the tunica vaginalis. They and other observers found in chronic essential hydrocele either endothelial cells or none at all; in symptomatic hydrocele they found numerous cells—polynuclear in gonorrhœal cases and lymphocytes in tubercular cases. In a traumatic hydro-

cele Dopter and Tanton found a predominance of lymphocytes, but after injection of iodine the fluid became rich in polynuclear cells.

Julliard[a] confirms and completes these views, and some of his conclusions are as follow:—

1. That in essential hydrocele the fluid contains endothelial cells, either in flakes or isolated.

2. In gonorrhœal hydrocele it contains chiefly polynuclear leucocytes.

3. In tubercular cases it contains chiefly lymphocytes.

4. The appearance of lymphocytes, or even of polynuclear cells, may depend on irritation, such as puncture without the existence of any bacterial process.

5. The cell contents of fluid depends more on the clinical character of the affection than on its nature.

6. The presence of endothelium alone in a fluid is not sufficient to stamp the case as essential hydrocele, as any very chronic affection may be accompanied by this condition. It has also been found that many essential hydroceles, especially those which had not previously been tapped, contain spermatozoa in their fluid. Spermatozoa are said not to occur in symptomatic hydrocele.

In articular effusions, too, Widal and Ravaut's formulæ generally hold good, though some observers have obtained results not in accord with them. Thus in some old tubercular effusions into joints polynuclear cells have been found to predominate, and in very chronic effusions of a gonorrhœal nature lymphocytes have been found.

Julliard from his observations draws the following conclusions. There are found:—

1. In gonorrhœal cases, if acute, nearly all polynuclear cells; if subacute, polynuclear and endothelial cells; if without fever, lymphocytes.

[a] Julliard. Cited by Descos. Revue de Médecine. 1902.

2. In rheumatic cases—acute, polynuclear cells; in chronic cases, lymphocytes and endothelium.

3. In tubercular cases, lymphocytes chiefly, with some endothelial cells.

4. Puncture or other irritation causes an increase of lymphocytes and the appearance of polynuclear cells.

5. The absence of endothelial cells does not show that the effusion is tubercular.

6. The presence of polynuclear cells in a fluid is not a sign of bacterial origin, but of the acuteness of the morbid process, whether its origin is infective, toxic, or traumatic.

Cerebro-spinal fluid is not, of course, exactly similar to effusions into serous cavities, but Widal and Ravaut, after cytological examination of it in meningitis, considered that their results justified them in extending to it the conclusions they had arrived at in the case of pleural effusions.

Wentworth had previously noted that in tubercular meningitis lymphocytes were very abundant in cerebro-spinal fluid, and polynuclear cells very few.

In their first communication on the subject, Widal, Sicard and Ravaut[a] arrived at the following conclusions:—Normally, and in many acute and chronic diseases, there are no nucleated cells in the cerebro-spinal fluid, but when the meninges are inflamed cells are present and vary with the nature of the exciting agent, being chiefly lymphocytes in the case of the tubercle bacillus, and polynuclear leucocytes in the case of other infective agents. It was, however, subsequently shown that the cerebro-spinal fluid if examined with great care does show a few lymphocytes normally, and that, though generally tubercular meningitis is accompanied by a predominance of lympho-

[a] Cytodiagnostic de la Méningite Tuberculeuse. C. R. Soc. Biol. 1900.

cytes, in some cases (about 20 per cent. according to Lewkowicz) this predominance of lymphocytes is succeeded very slowly by a predominance of polynuclear cells. It was also found that lymphocytes were predominant and abundant in general paralysis, and in tabes and syphilitic affections; so that Widal no longer considered the lymphocyte the specific element of tubercular meningitis, but as a general sign of a meningeal reaction not sufficiently intense to require such powerful protective agents as polynuclear leucocytes.

It is not easy to determine what number of cells in cerebro-spinal fluid is to be considered pathological. Sicard suggested that when a preparation made in the usual way did not contain more than four cells in a field of the microscope, with Leitz No. 7 object glass, it was to be considered normal. It has also been sought to make a precise count of the cells, and those that contain more than half a cell per cubic millimetre are considered abnormal. Widal does not think this counting practicable, and states that it is usually easy to tell at the first glance if an increase of cells is present.

In tubercular meningitis Widal found that there was always a lymphocytosis, and that the lymphocytes formed 68 per cent. and upwards of the total cells present. Many other observers have got entirely similar results to these, but others, though agreeing generally, have not always got results which were in accord with Widal's tubercular formula. I shall mention some of the discordant results obtained.

Lewkowicz, as I have mentioned, showed that cases in which at first there was predominance of lymphocytes changed slowly so as to present a predominance of polynuclear cells. He attributed the change to the occurrence of caseation.

Mutzner found in one case, which at *post-mortem* was shown to be tubercular meningitis with purulent infiltration of the membranes, in the fluid obtained three days before death, only polynuclear cells. Others have found that the cerebro-spinal fluid in some cases, which at *post-mortem* were shown to be tubercular meningitis, contained hardly any cells, and lymphocytes were found to predominate in a case which, from the sacrum reaction, was believed to be typhoid fever, but generally in typhoid the cerebro-spinal fluid is normal.

The great majority of the observations recorded are in favour of the view that if in a case of meningitis the cerebro-spinal fluid shows a predominance of lymphocytes the meningitis is of tubercular origin, but the lymphocytes, instead of being, as they are in the tubercular pleural effusions, 90 to 98 per cent., are sometimes not much above 50 per cent.

The discordant results that have been obtained are, however, so numerous that they require explanation, and it cannot be said that any sufficient explanation is forthcoming. The differences may possibly be connected with the different forms that tubercular meningitis may assume. Thus cases occurring in young children are said, though sometimes not containing many cells, to show the purest lymphocytosis. In such cases the disease generally runs a very rapid course; caseation has not time to occur, the cerebro-spinal fluid remains clear, and the membranes are not infiltrated. In adults, where the disease may last weeks or months, caseation has time to occur, and the cerebro-spinal fluid is often turbid. It is in these latter cases that polynuclear cells have been generally found to predominate. It is also necessary to consider in this connection the possibility that secondary infection by a pyogenic organism may account for the polynucleosis which has been observed.

Bernard found in a case of tubercular meningitis, verified *post-mortem*, in the cerebro-spinal fluid, 146 lymphocytes and 36 polynuclear cells; four days later he found 36 lymphocytes and 157 polynuclear cells. The augmentation of the polynuclear cells corresponded with an infection by pyogenic bacteria, as was shown by cultures. A similar case has been described by Brunneau and Hawthorn, where pneumococci caused a secondary infection and polynucleosis. It appears probable that some of the discordant results alluded to may have been due to such causes.

By the consideration of these and other circumstances it is possible that practical rules of diagnosis may be laid down, but at present, though lymphocytosis has some value as a sign of the tubercular nature of meningitis, its value is not so great as in pleural effusions. The value of lymphocytosis as a sign of tubercular affection is also diminished by certain observations of Widal and others that certain cases with acute—sometimes very acute—symptoms of meningitis, and which are accompanied by a lymphocytosis of the cerebro-spinal fluid, get well on anti-syphilitic treatment; so that syphilitic as well as tubercular meningitis is accompanied by a cerebro-spinal lymphocytosis.

In acute non-tubercular meningitis all observers are agreed that polynuclear cells greatly predominate in the cerebro-spinal fluid. In epidemic cerebro-spinal meningitis it has been found that polynuclear cells generally disappear as the case improves and are replaced by lymphocytes, which gradually disappear when the case gets well. If a relapse occurs the polynuclear leucocytes are said to reappear.

The cells of the cerebro-spinal fluid have also been studied in numerous nervous diseases, organic and

functional, and in cases of mental disease. I shall mention only the more important results.

In tabes, general paralysis, and syphilitic meningomyelitis a considerable number of cells are found in the cerebro-spinal fluid, and there is a predominance of lymphocytes, even in the early stages; while in peripheral neuritis, hemiplegia, and hysteria, either no cells or only the normal number. Disseminated sclerosis and Friedreich's disease sometimes show lymphocytosis, but this is not found in all such cases. In mental affections generally, with the exception of general paralysis, there is no lymphocytosis. In herpes zoster the cerebro-spinal fluid is sometimes normal, but often shows a lymphocytosis. It never shows a polynucleosis, though the affection is so acute, and micro-organisms have sometimes been found in the fluid.

Lymphocytosis is found in many cases of recent syphilis, not only in cases where there are clinical signs of a nervous lesion, but in cases who complain only of headache or asthenia. After intradural injection of cocaïn a polynucleosis occurs, which after 3 or 4 days gives way to a lymphocytosis, and this in its turn, after 8 to 20 days to the normal condition. In acute alcoholic delirium, and generally in chronic alcoholism, the cerebro-spinal fluid is normal.

To sum up the conclusions which may be drawn from the results I have related:—

In serous and serofibrinous effusions of the pleura, Widal and Ravaut's cytological formulæ are a reliable test of the nature of an effusion, if account be taken of the variations made necessary by the results obtained by Wolff and others in the early stage of tubercular effusions.

As regards pericardial and peritoneal fluids, the examinations made are not sufficiently numerous, nor are their

results sufficiently consistent to warrant any precise conclusions at present.

Effusions into joints and hydrocele fluids have yielded results which are in general agreement with the views of Widal, and the factors which influence their cytology, such as the acuteness or chronicity and the influence of puncture, have been so carefully studied that it seems possible to draw some conclusions sufficiently precise to be an aid to diagnosis.

In cerebro-spinal fluid, though cases have been recorded with normal cerebro-spinal fluid and with polynucleosis, most cases of tubercular meningitis are accompanied by lymphocytosis. The fact that lymphocytosis occurs in tabes and general paralysis does not seriously diminish its value as a sign of tubercular disease, as the former conditions could not possibly be mistaken for the latter. Lymphocytosis is a sign of certain affections belonging to different groups, but in each group it can serve to differentiate different affections.

In acute meningitis polynucleosis occurs in the non-tubercular variety, and though it may occur in the tubercular variety also, it is then not so pure a condition as in non-tubercular cases. Polynucleosis may give way to lymphocytosis in non-tubercular cases, and lymphocytosis may give way to polynucleosis in tubercular cases; and hence tubercular and non-tubercular meningitis may come to have cytological formulæ that are identical; but it is to be remembered that in tubercular cases the polynucleosis is accompanied by an aggravation of the symptoms, while in non-tubercular cases the lymphocytosis is accompanied by an improvement of the symptoms.

The differential diagnosis of meningitis from typhoid with meningeal symptoms may be assisted by cytology in many cases, but it must be remembered that not only have

cases of meningitis with normal cerebro-spinal fluid been described, but one case of typhoid has been reported where the fluid was lymphocytic.

The presence of lymphocytosis is quite constant in general paralysis, tabes, and meningomyelitis, and may serve to distinguish them from other affections that more or less resemble them. It may also serve to distinguish general paralysis, even in a very early stage, from other mental diseases.

We have seen that tubercular effusions in all cavities are generally characterised by a lymphocytosis. How is this to be explained? It is not special to tubercular effusions, as we have seen, but when it occurs in a tubercular affection is it due to the positive chemotactic action on lymphocytes of a special toxin produced by the tubercle bacillus? or is it due, as many have urged, to the clinical character of the affection? It was laid down by Ehrlich, in his book, "Die Anæmie," that lymphocytes had no amœboid movement, but were only subject to passive movements. However, the opinion seems to gain ground that lymphocytes have a true motility. We may, therefore, suppose a positive chemotaxis due to a tubercular toxin possible. But we know nothing of such a toxin, and, moreover, lymphocytes had not been observed in effusions due to the tubercle bacillus before these cytological examinations began.

Experiments have been made with a view of clearing up this point. Widal after intrameningeal injection of tubercle bacilli found a lymphocytosis of the cerebro-spinal fluid, up to 80 per cent. of lymphocytes being found. With pneumococci or staphylococci he produced a strong polynucleosis. Pleural effusions of a lymphocytic character have been obtained by subcutaneous inoculation of tubercle bacilli in a guinea-pig. When injected into the pleural cavity of a dog the tubercle bacillus caused an effusion con-

taining much endothelium, as well as both lymphocytes and polynuclear cells. Injection of typhoid bacillus caused a polynucleosis, as did injection of an aseptic material—aleuron grains. By injecting diphtheria bacillus or its toxin subcutaneously Widal produced a pleurisy. This was a very acute process, but only lymphocytes (and no polynuclear cells) were found in the effusion. This observation of Widal has been confirmed.

As I have already mentioned in herpes zoster, also an acute process, when any change occurs in the cerebro-spinal fluid it is always lymphocytosis, so that there is some experimental evidence that acute microbic infections, and particularly tubercular infections, can cause an exudation of lymphocytic character.

On the other hand, there is a great deal of evidence in favour of the view which most observers seem to hold that polynucleosis is the rule in acute, and lymphocytosis in subacute and chronic, processes, and that the nature of the process is of no account. For instance, I have already mentioned that Julliard found that in joint effusions of gonorrhœal origin the cell contents were polynuclear in acute cases, whereas in chronic cases they were lymphocytes. He considers that very chronic effusions of all natures are characterised by the presence of endothelial cells; that effusions of an infective nature are, if chronic or sub-acute, characterised by the presence of lymphocytes, and if acute, whatever their causation, by polynuclear cells. The observations of Wolff on the different cell contents of tubercular pleural effusions, according as they are examined in an early or late stage, also favours this view, as do others of the observations I have related.

But even if it be admitted that the clinical character of the process is the main factor that regulates the cell contents, it seems possible that the nature of the process may

also influence it. Wolff points out that he has failed to find a single lymphocyte in such chronic effusions as very old empyemas, while the most acute cases of tubercular meningitis are those that are accompanied by the purest lymphocytosis of the cerebro-spinal fluid.

This whole question calls for further research, and the value of cytological examinations for practical purposes is not diminished by the fact that this point is still the subject of dispute.

I have placed before you sufficient facts, I hope, to enable you to judge what the present position of the cytology of serous effusions is. The results of cytological examinations generally can only be properly interpreted in connection with the clinical history of the patient. They are influenced by some factors which we know; they are probably also influenced by factors which we do not know at present. There are still many discrepancies, and there are many points connected with the subject which call for further work on the part of the clinician and on the part of the pathologist. But so many of the observations made on the subject have received general support that cytodiagnosis appears worthy to take its place beside other microscopic methods of clinical diagnosis.

CASE OF TUMOUR OF APEX OF ORBIT (ALVEOLAR SARCOMA OR ENDOTHELIOMA).

By ARTHUR H. BENSON, F.R.C.S.,

AND

LANGFORD SYMES, M.D.

[Read in the Section of Pathology, November 6, 1903.]

C. C., a married woman, aged forty-eight (S. M. O. H. No. 61, Jan. 28, 1903), came under my care in January last suffering from total blindness of the right eye and some proptosis.

History.—She stated that three years previously, when feeding a calf, the animal suddenly raised its head, striking her right eye.

In the *right eye* the sight began to fail about two months after this blow, and was almost wholly gone in twelve months. Ever since the sight began to fail the right eye has been "swelling and pushing out."

The *left eye* was quite well, she says, till a week ago, when it got red and painful, and the sight in it began to fail. This was caused apparently by an attack of iritis, and there were tags of synæchia posterior already formed; vision was only $\frac{6}{18}$, tension was normal, and there was doubtful haziness of the disc.

In the right eye, the one in which she had received the original injury, sight was absolutely lost—R.V. = 0. The tension was normal, the pupil was semi-dilated, and acted to accommodation, but not to light, and under atropin dilated evenly. There were no evidences of iritis, past or present. There was total white atrophy of the disc, but otherwise the contents of the globe were normal. The eyelids were red, thick, and swollen, especially the upper one, and appeared to be bulged out by a soft mass under them. The conjunctiva was thickened and covered by a network of swollen and varicose veins, but there was no conjunctivitis properly so-called, and the lids had grown in proportion to the mass below them, so that they easily closed over the cornea without any undue pressure. Masses of tortuous

and varicose veins were specially abundant at the outer side of the conjunctiva. The globe appeared to be displaced *downwards* ½ an inch, *outwards* ¼ of an inch, and *forwards* ½ an inch. The movements of the globe were very limited in all directions.

On examining the socket nothing of the nature of a definite tumour could be felt, but the mass of tissue under the lids felt rather lumpy, with here and there a slippery nodule like a melon-seed body. The first idea that suggested itself was a *vascular tumour* of some sort, but pressure did not produce diminution in the size of the orbital contents, or permit the globe to go back at all, nor was any vascular murmur discoverable with the stethoscope. *Fatty tumour* was the next most likely idea, but no definite limits to the tumour could anywhere be felt, and if fatty at all, it must be hypertrophy of the orbital fat in general, but neither hypertrophy of the orbital fat nor a varicocele would account for the great immobility of the globe. There was no vascular murmur, as I have stated, but there was an extraordinarily loud respiratory murmur heard, both with inspiration and expiration. It was heard over both eyes, but very much louder over the right eye. At this stage of the investigations she suddenly disappeared from hospital, and went back to Co. Galway.

Six months later she returned with a fresh attack of acute iritis in the left eye, and was sent to the Royal City of Dublin Hospital. The respiratory bruit was as loud as ever. The proptosis and other conditions had hardly changed at all during the time, though the conjunctiva of the right eye was more watery and the varicosity of the vessels was greater, as also was the general fulness of the orbit; still no definite tumour of any sort could be felt.

I showed the case to all my colleagues at both hospitals, but no definite diagnosis was arrived at, so I made an exploratory incision, removed a large quantity of superfluous orbital fat, and eventually was able to get my little finger deep enough into the orbit to feel a hard mass surrounding the optic nerve and the back of the globe. In its hollow the globe sat like an acorn in its cup. It was very hard, and was with considerable difficulty shelled off from the walls of the apex of the orbit, into which it fitted accurately.

I have this day (Nov. 6, 1903) heard of the woman, and her husband says she is better and going on well, and that he hoped

she would soon be all right. She wears an artificial eye. The very slow growth of the tumour, its very slight apparent malignancy, and the extraordinary loudness of the respiratory bruit, are worthy of special note. The specimen I handed to Dr. Symes for examination, and he has kindly made sections of it, and reports as follows:—

"*Pathological Report.*

"The tumour measures 2 × 1½ inches, a firm solid mass, tolerably heavy, and white on section. It is not encapsuled. It was removed in one piece, and had apparently no bony attachment. The optic nerve can be traced through it. The eyeball is free, and was lodged in a depression of the surrounding growth.

"*Microscopically.*—1. (Low power)—It consists of a conglomerate mass of separate loculi of small size, and circular or ovoid in shape, giving the tumour an alveolar appearance. These loculi contain masses of cells whose nuclei stain well, and are of round or ovoid form. Some of these have invaded the sheath of the optic nerve.

"2. (High power)—The walls of these alveoli are seen to be composed of cells of elongated or spindle shape, arranged in a circular fashion around the alveolus.

"The chief points about the tumour are the large number of these loculi, their small size, the density with which they are packed together, and their walls being composed of elongated cells.

"As to the nature of the tumour it apparently belongs to sarcomata, but having a peculiar locular or alveolar arrangement, is best described as an alveolar sarcoma, or endothelioma."

[See page 339, *post.*]

A PRELIMINARY REPORT OF SOME INVESTIGATIONS INTO THE ÆTIOLOGY OF LEUKÆMIA.

By T. GILLMAN MOORHEAD, M.D., D.P.H., (Univ. Dub.);
Physician, Royal City of Dublin Hospital.

From the Pathological Laboratory, Trinity College, Dublin.

[Read in the Section of Pathology, December 4, 1903.]

Since the first recognition of leukæmia as a distinct clinical and pathological entity, nearly sixty years ago, this disease, along with most others which principally affect the blood-forming tissues, has remained an etiological puzzle, and although many have investigated the subject and some few have attempted to produce the disease experimentally in the lower animals, no definite and confirmed result has as yet been reached.

Of late, discussion and investigation have principally centred around the inter-relationships of the different diseases to which the generic term leukæmia is applied, and attempts have been made to prove that they are all primarily diseases of the bone marrow. It is not my intention, however, to enter into this discussion or to consider the supposed different functions and properties of the various forms of white blood corpuscles. It is sufficient to state that both the lymphatic and spleno-medullary type of disease appear to be essentially the result of morbid changes in the hæmopoietic tissues, and that in both diseases changes in all parts of those tissues may be expected to occur. The close physiological connection of the spleen, bone marrow, and lymphatic glands has, indeed, been shown by their universal re-action to lymphotoxic and

myelotoxic sera.[a] Moreover, the occurrence of cases[b] in which, so far as the blood itself is concerned, the type of disease changes, by a myelocytæmia becoming converted into a lymphocytæmia, supports Flexner's results, and is referred to in order to point out that in experiments attempting to produce either form of leukæmia the actual production of any changes in the hæmopoietic tissues will have a positive value.

The various theories that have been advanced concerning the etiology of the disease may be reduced to two—namely, (1) the parasitic theory, and (2) the toxic theory.

Writing in 1898, Robert Muir,[c] in "Allbutt's System of Medicine," states that no parasite of the nature of the malarial organism has been observed in leukæmia, and that there is no adequate evidence that any bacterium is concerned in the disease. Since that date, however, Löwit[d] has described an amœboid organism, which he calls the Hæmamœba leucæmiæ magna, and which, he states, can be demonstrated by special staining methods in the blood and tissues of patients suffering from spleno-medullary leukæmia. A similar, but smaller, organism, which he terms the Hæmamœba leucæmiæ parva, is to be found, according to the same observer, in the blood of lymphatic leukæmia patients. These organisms are stated to form spores, and to pass through stages very similar to those of the malarial parasite. They have not, however, as yet been

[a] Flexner. The Pathology of Lymphotoxic and Myelotoxic Intoxications. Univ. of Penva. Med. Bulletin. 1902. XV. P. 287.

[b] (α) A Case of Leukæmia with Change of Type in the Appearances of the Blood. By Robert Wilkinson, M.D., &c. Lancet, June 20th, 1903. (β) Seelig. Deutsche Archiv. für klinische medecin. 1895. (γ) Archiv. für klinische medecin. Band LVII. Van der Wey.

[c] System of Medicine. Clifford Allbutt. Vol. V. Leucocythæmia. Page 652.

[d] Löwit. Die parasitäre Natur der Leukämie. Centrbl. für Allgemein. Path. u. Path. Anat. 1901. P. 913, et seq.

artificially cultivated. By injections of fresh tissues obtained from leukæmic patients immediately *post mortem*, Löwit claims to have produced in rabbits pathological changes which closely resemble those found in myelogenic leukæmia, and to have found the hæmamœba in the diseased parts. Similar injections into dogs, cats, and guinea-pigs did not produce any changes. So far as I am aware, these results have not as yet been confirmed, although it is now more than three years since the date of their publication, and until they are fully confirmed they must be received with extreme caution. It is a remarkable fact that dogs and cats, which are sometimes the subject of leukæmia under natural conditions, should prove quite refractory to injections of tissues presumably containing the specific parasite of the disease, while rabbits should be at once and easily infected, and that a series of changes should be produced in them in almost every organ and tissue which is usually affected in man. Somewhat similar attempts to produce the disease made by Bolinger[a] and Mosler, before the parasite theory was mooted, gave negative results.

Among the other micro-organisms which have been found in the blood in leukæmia various forms of streptococci are the most common, but they have not been found with sufficient frequency to justify any conclusions concerning their relation to the disease.

Turning now to the toxic theory, we find that there is a certain amount of evidence in favour of the view that the disease is a toxæmia resulting either from disturbed or disordered metabolism, or else from the absorption from the intestines of some toxic products, and my own experiments confirm me in the view that there is a toxin present in the body. I have, however, as yet no evidence throwing

[a] Virchow's Archiv. Bd. LIX. P. 341.

light upon the origin of the poisonous substance, and it may well be that subsequent research will show it to be bacterial in origin.

The following facts appear to me to favour the view that some toxin is the morbific agent:—

1. In many leukæmic cases the onset has been preceded by some other disease (*e.g.*, malaria[a]) which has lowered the general resisting power of the organism, and has disturbed the normal course of metabolism.

2. Inflammatory affections of the mouth, stomach, and intestines are frequently present, and may precede the development of the disease. This fact, combined with others which will be immediately stated, led Köttnitz to hazard the suggestion that the disease was a toxæmia produced by the absorption of peptones from the alimentary canal, the mucous membrane of which had lost its power of converting peptones into albumin.

3. Peptones and uric acid can usually be found in the blood of leukæmic patients, and there is said to be an excess of peptones in the spleen.

4. By repeated injections of peptones a state of continued leucocytosis can be produced in animals, although no organic changes have been thus brought about.[b]

5. A congenital form of leukæmia resulting from a septic toxæmia has been described by Finkelstein.

6. The blood of leukæmic patients is less coagulable than normal—a fact which is attributed to the presence of histones, peptones, or albumoses, inasmuch as a similar condition can be produced by the injection of such substances.

7. Leukæmia is often associated with other diseases, the prominent symptoms of which are produced by toxins—*e.g.*, tuberculosis.

[a] Reynolds' System of Medicine. Leucocythæmia. By W. R. Gowers.
[b] Vehsemeyer. Munch. med. Wochenschrift. 1893.

8. In the urine there is evidence of increased breaking down of tissue, together with deficiency of metabolism, for the ammonia salts and purin substances are increased in amount, and a form of nucleo-histon has been found. The increase of ammonia salts may, of course, be taken as evidence that there is an increased formation of acids in the body.

9. The tendency to the development of capillary hæmorrhages suggests the presence of some hæmolytic toxin.

10. The areas of necrosis found in various tissues of the body as a result of the disease also suggest the action of a toxin.

If from the above facts we assume the presence of a toxin in the tissues we must suppose the lymphatic hypertrophy to be either a compensatory overgrowth designed to make up for an excessive leucocytal destruction, or else to be a direct re-action to the presence of the toxin within the glands, these last acting as filters and suffering themselves in endeavouring to protect the organism. Of the two possibilities the latter appears more in accordance with the facts, because there is more evidence of increased formation than of excessive destruction of the white blood cells. The uric acid and xanthin bases in the urine are indeed increased, and this shows that there is an increase of katabolism; but this increase is slight as compared with the general increase of the cellular constituents of the body.

It may be mentioned here that even if a toxin does exist in the glands it can hardly be possessed of very acute poisonous properties, since the changes caused by it in the animal body run a very chronic course, as a rule, and appear to be more the result of a stimulating poison than of an actively destructive one.

Following the above indicated line of reasoning, I determined to try the effects upon animals of the injection

hypodermically of extracts of glands obtained from a patient who had suffered from the lymphatic form of the disease. The material at my disposal consisted of 135 grammes weight of glands. This was divided into two equal parts, and the following extracts were made:—

1. An alcoholic extract. The alcohol was filtered off after a fortnight and was evaporated to dryness at a low temperature. The residue was dissolved in 2 per cent. sterile saline solution. A small amount of thymol was added to prevent decomposition, and the solution was frequently tested to prove its sterility.

2. A glycerine extract of the second portion of glands. The extract was filtered and sterilised by thymol. The quantity of glycerine used was five ounces.

3. The alcohol was filtered and evaporated at a low temperature off the first set of glands; 2 per cent. saline solution was poured upon them. After a week this was filtered off and sterilised as before.

Similar extracts of as nearly as possible the same strength were made of normal human glands obtained from *post-mortem* examinations in accident cases, so that in all six extracts were prepared.

Chemical Analysis.—This showed (1) that the saline solution of the alcoholic extract of the leukæmic glands contained a minute trace of phosphorus. The proteid tests gave a negative result. (2) The glycerine extract of leukæmic glands contained some albumose, and also a slight trace of phosphorus. (3) The saline solution extract of the alcoholic residue of leukæmic glands contained a large quantity of phosphorus and a trace of albumose. (4) The extracts made from normal glands all contained some phosphorus. The saline solution extract of the alcoholic residue contained the largest amount, and a comparison with the similar extract from the leukæmic glands

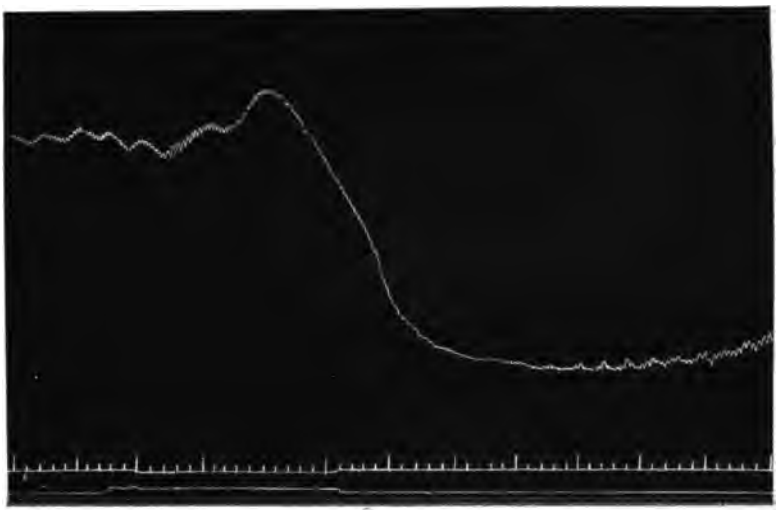


FIG. I.—Injection of saline extract of the alcoholic residue of leukæmic glands.

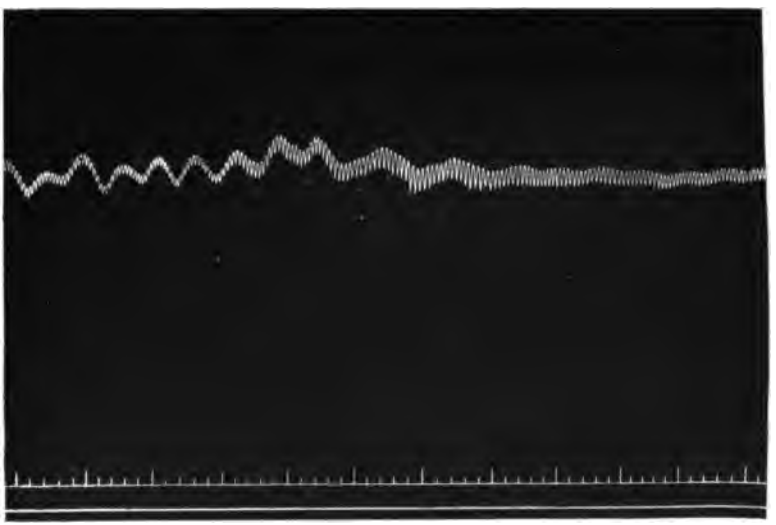


FIG. II.—Injection of the saline extract of the alcoholic residue of normal glands. Owing to the marker failing to act, the moment of injection is not indicated.

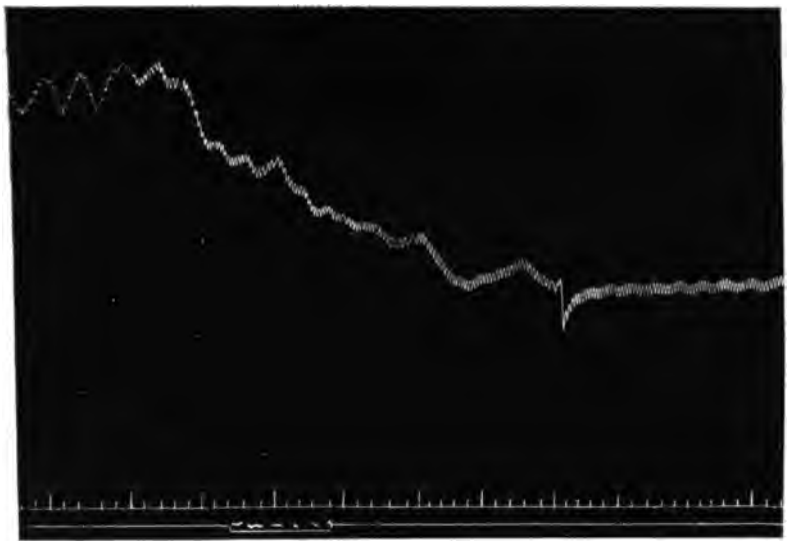


FIG. III.—Injection of glycerine extract of normal glands.

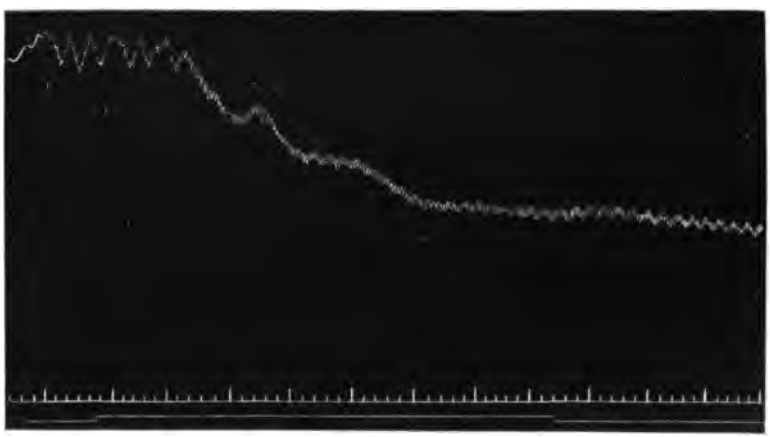


FIG. IV.—Result of injection of pure glycerine.

showed the quantities contained in the two to be almost identical. The proteid tests gave indefinite results.

BLOOD-PRESSURE EXPERIMENTS.

1. Saline solution of evaporated alcoholic extract of leukæmic glands:—Intravenous injection of this extract into a full-grown anæsthetised rabbit caused a slight increase in force of the individual heart beats, and a slight rise in blood-pressure, which was followed after a few seconds by a fall to and below the normal. This was again succeeded after a variable time—usually over a minute—by a rise above the normal. In one experiment only was the respiration affected, and in this case only very temporarily. It became very jerky, irregular, and deep.

2. Intravenous injection of the same amount of the similar extract obtained from normal glands produced practically no effect.

3. Saline solution of alcoholic residue of leukæmic glands:—Immediately after injection there was a slight rise in blood-pressure, followed quickly by a very pronounced fall, close to the base line. This was again succeeded by a gradual rise up to about two-thirds normal. During the fall of blood-pressure the heart beats became very feeble, and respiration was also disturbed. (Fig. I.)

4. Injection of the similar extract from normal glands caused respiration to become temporarily quick and shallow, but had no effect on blood-pressure or heart action. (Fig. II.)

5 Glycerine extract of leukæmic glands:—The injection of this extract caused an immediate slight rise in blood-pressure, followed by a fall, which was again followed by a gradual rise up to and greatly beyond the normal. This latter rise was very prolonged. The individual heart beats were at first increased in force. Respiration was momentarily suspended at the time of injection and remained for some time shallow and quick. (Fig. III.)

6. Injection of the glycerine extract of normal glands produced almost the same effects as that of the extract from leukæmic glands, and in consequence it became necessary to determine the effect of injection of pure glycerine. This was accordingly done, and it was found that the latter caused also a fall followed by a prolonged rise of blood-pressure, producing, in fact, a tracing which was almost identical in appearance with the two preceding ones. (Fig. IV.)

In my further investigations young rabbits of from six to ten weeks old were employed, but before undertaking any experiments, with the object of ascertaining if leukæmic changes could be produced in their tissues by hypodermic injections of the above extracts, it was necessary to obtain a thorough working knowledge of the cells of the body fluids, lymph glands, spleen, bone-marrow, and thymus gland in these animals. For this purpose I repeated, as far as necessary, the work of Kanthack and Hardie, an account of which is published in the seventeenth volume of the *Journal of Physiology*,[a] and with the exception of a few minor points am able to confirm their results in every particular.[b] To their work I would add the following facts:—(1) A horse-shoe shaped nucleus is not entirely confined to the coarsely granular oxyphile cells, but both in the blood and in the bone marrow can be found in the finely granular oxyphiles. The granules of the coarsely granular oxyphiles do not attain to the size of the largest granules found in myelocytes, nor are they as numerous as those found in the cells of the bone marrow.

[a] Wandering Cells of Mammalia. Kanthack and Hardie. Journal of Physiology. Vol. XVII.

[b] Since writing the above I find that Noël Paton and others, writing on "The Relationship of the Spleen to Formation of Red Blood Corpuscles" in the 28th volume of the Journal of Physiology, state that they have repeated and confirmed Kanthack and Hardie's work.

(2) I cannot agree with Kanthack and Hardie in regarding the granules of the finely granular oxyphile cells as purely oxyphile in staining properties, for in several preparations I found that they assumed a violet colour when stained with eosin and methylene blue. This occurred not only when these stains were used successively, but also when used according to Leishmann's formula. Occasionally even I have found some granules to take a pure blue colour. With a laboratory preparation of Ehrlich's tri-acid stain the granules were always violet, but with the same stain obtained from Grüebler they were invariably of a deep red colour. As, however, I cannot go so far as Noël Paton, who applies the name amphophiles to these cells, I have retained Kanthack and Hardie's name.

3. With all ordinary staining mixtures the protoplasm of the hyaline cells assumes a diffuse rather dirty pink or pinkish blue colour.

4. I am able to confirm the observation of Kanthack and Hardie, and of Max Schultze, that intermediate forms can be found between lymphocytes and negative cells in the peritoneal fluid, and I have noticed similar intermediate forms in the bone marrow.

A series of differential counts gave the following results:

Coarsely granular oxyphiles	2.1	per cent.
Finely granular oxyphiles	24.6	,,
Hyaline cells	9.0	,,
Lymphocytes	63.0	,,
Basophiles	1.3	,,

This may be summarised by stating that the oxyphiles form about 27 per cent. and the mononuclear leucocytes about 72 per cent. of the white cells of the blood. According to Kanthack and Hardie the number of lymphocytes present varies much, being most abundant after a meal, and it is important, of course, that this liability to variation should be kept in mind. The actual number of the white

cells also varies much (from 6,000 to 12,000 per c.mm.), and consequently the production of slight blood changes experimentally must be regarded as of less importance than the production of tissue changes.

In studying the peritoneal fluid I followed closely the methods of the two authors already mentioned, and can fully confirm their results. The small type of coarsely granular oxyphile which they describe as being present in this fluid is also occasionally met with in the blood.

The bone marrow of the upper end of the femur was at first studied, but as it soon became apparent that the relative number of the different cells varied a good deal in different parts, it became necessary to make series of vertical sections through the whole length of the red marrow, which in young rabbits extends through the whole medullary cavity of the femur as a solid column, and can easily be shelled out entire. Smear preparations were also made in order that the form of the individual cells might be more closely examined. Following Dominici[a] I recognised the following types of cells, though variations from these types are extremely numerous:—

1. *Megacarocytes.*—Large giant cells possessing a lobed and usually ring-shaped nucleus. The protoplasm is apparently structureless, and assumes a pinkish tint with the tri-acid stain. Excluding nucleated red blood corpuscles, these cells average nearly 2 per cent. of the cells of the marrow.

2. *Hyaline Cells.*—These are fairly abundant, and form about 20 per cent. of the white cells present. They are very variable in size, and usually possess an oval nucleus, though variations in the shape of the latter are not uncommon. In some of them a few granules staining violet

[a] Manuel d'Histologie Pathologique. Ranvier. "Sang et Moelle Osseuse." By Dr. H. Dominici.

with the tri-acid stain are to be seen, usually clustered at one end of the cell, and in consequence these cells are regarded as precursors of the amphophile myelocytes. A few lymphocytes can be seen in the marrow, and also intermediate forms between them and the hyaline cells.

3. *Myelocytes with Small Granules.*—These are the so-called amphophile myelocytes. They form about 60 per cent. of the white cells of the marrow. Their nucleus varies very much in shape, but is most frequently spherical or bi-lobed.

4. *Myelocytes with Large Granules.*—These, the eosinophile myelocytes, form about 15 per cent. of the white cells. They vary much in size. Their granules are somewhat larger than any met with in the normal blood, but they show also a distinct tendency to variation in size. They stain a pure red with eosin and Löffler, and assume an orange tint when stained with Ehrlich's mixture. Several of these cells possess a horse-shoe shaped nucleus, but a large oval nucleus is more common.

5. *Myelocytes with Basophile Granules.*—These are comparatively few in number, and are best seen in smear preparations.

6. *Nucleated Red Blood Corpuscles.*—Normoblasts are most numerous, but occasionally megaloblasts and microblasts are met with. The nucleus stains deeply and is nearly always spherical, but in some preparations a few cells with bi-lobed nuclei are met.

The lymph glands and thymus do not require special mention. In the spleen the number and size of the Malpighian corpuscles varies somewhat in different parts, and consequently it was necessary to make sections of the whole organ for the purpose of comparison. The blood contained in the pulp spaces contains a large number of white cells, both lymphoid and granular.

INJECTIONS.

I. Two rabbits were inoculated with the glycerine extract of leukæmic glands. One cubic centimetre was injected daily beneath the loose skin at the back of the scapula. The first rabbit died after the eighth injection, the second after the twenty-eighth. The second rabbit progressively lost in weight from the commencement of the experiment and had severe diarrhœa, but its temperature never exceeded 99° F. The blood was frequently examined, and a considerable amount of anæmia was noticed, but no constant changes in number of the white cells were found. In neither of the two animals were any leukæmic changes found. The white cells of the blood were normal both in appearance and in absolute and relative numbers, and the bone marrow did not exhibit any changes, nor did the spleen. The axillary lymph glands near the site of injection were enlarged and congested, but no other lymph glands were changed. The kidneys showed in each case the characteristic appearances of acute parenchymatous nephritis, which, I believe, must be chiefly ascribed to the effect of the glycerine. Cultures from blood and spleen were negative. Owing to this negative result no injection of the similar extract prepared from normal glands was made.

II. Three rabbits were treated with the saline solution of the alcoholic extract of leukæmic glands, 1 cc. being injected every second day in the posterior scapular region.

First Rabbit.—Five injections in all were given. On the day following the last injection the animal appeared to be very ill, and was accordingly chloroformed. During the period of experimentation it lost slightly in weight, but its temperature never exceeded the normal.

Post-mortem Examination.—In the blood there was a marked relative increase in the number of the coarsely

granular oxyphiles. A differential count of the white cells gave the following result:—

Lymphocytes	33.5	per cent.
Hyaline cells	10.8	„
Coarsely granular oxyphiles	13.5	„
Finely granular oxyphiles	40.2	„
Basophiles	2.0	„

The granules in the finely granular oxyphiles appeared fewer than normal, and in several of the cells they assumed a distinctly bluish colour, with both the tri-acid and eosin and Löffler stains. In some cells the granules in one part were red and in other parts blue. The relative diminution of lymphocytes I do not regard as important, as the rabbit had been feeding badly for some time previously. There was no absolute increase of white cells present, but rather a slight diminution.

The red marrow showed a great increase of coarsely granular oxyphile myelocytes. In smear preparations they equalled or even slightly exceeded in number the myelocytes with small granules, and in sections the increase was also well marked, though not quite so striking. No other changes were noted.

The lymph glands, both axillary and inguinal, were enlarged, and their substance was infiltrated with oxyphile cells. These were most numerous immediately under the capsule and around the larger arteries, but were also present throughout the other portions of the glands.

The spleen was normal in size, and did not present any cellular changes, but there was a considerable amount of broken down hæmoglobin scattered through its substance.

The kidney was quite healthy, but the liver was extensively affected with coccidial disease. Cultures from blood were negative.

Second Rabbit.—This rabbit was found dying on the day following the tenth injection, and was accordingly chloroformed.

The blood was apparently normal, showing only a moderate increase of oxyphiles in relation to mononuclear cells. The axillary lymph glands, and also to a much less extent the inguinal and mesenteric, were enlarged; microscopically some infiltration of their substance with oxyphile cells were found, but this was slight as compared with the number found in the glands of the previous case. The spleen was normal in size, but slightly nodular on the surface, and, microscopically, was found to contain large quantities of broken down hæmoglobin. The red marrow did not present any very obvious change, except that the lobulation of the nuclei of the megacarocytes was very pronounced, and in some cells the nuclei were broken down into separate parts. After making several absolute and differential counts I also learned that there was a general cellular hyperplasia, and that there was an especial increase in number of those hyaline cells which contained a few violet staining granules. The kidneys and liver were normal in every respect. Cultures negative.

Third Rabbit.—This animal was chloroformed after the twenty-first injection owing to my supply having run out.

Post-mortem.—No changes were found in the naked-eye appearance of any of the organs except that the axillary lymph glands were enlarged. The blood was examined on several occasions during life, and also *post mortem*, but did not present any cellular changes. The marrow showed signs of cellular hyperplasia and, as before, an increase in number of those hyaline cells, which contained violet granules at one pole. The inguinal lymph glands, liver, spleen, and kidneys were quite normal.

Two control experiments were performed with the similar extract from normal glands. Both animals were killed after the twentieth injection. One of them was the subject of fairly well-marked coccidial liver disease, but showed no other pathological change. In the other no morbid change at all was detected. In neither of them were even the axillary lymph glands enlarged.

From the above series of experiments no conclusion, except, perhaps, a negative one, can be drawn. The very marked eosinophilia in the first rabbit must, I think, have been due to some adventitious cause, and it is to be noted that the smallest amount of tissue alteration was found in the rabbit which received the greatest number of injections. That the extract employed had some pathogenic properties may possibly be admitted and seems to show that further experiments with a similar extract prepared from the glands of another case might prove of value.

Three rabbits were subjected to injections of the saline solution extract of the residue left after filtering off the alcohol from the leukæmic glands. From the first I was more hopeful that this extract would produce definite leukæmic changes, owing to the fact that it produced such a marked effect on blood-pressure, and, as far as my experiments have gone, the supposition appears to have been somewhat justified. The first two rabbits received eight injections each and the third fourteen injections. This exhausted the amount of extract at my disposal, and in consequence I was unable to prolong the period of experimentation. The changes from normal in each of the three animals were almost identical.

First Rabbit.—Blood.—The red cells were reduced from 5,200,000 to 3,000,000. The white cells bore a proportion to the red of 1 to 300.

A differential count gave the following numbers:—

Oxyphile cells	40	per cent.
Lymphocytes	50	„
Hyaline cells	8.4	„
Basophiles	1.6	„

In one preparation a few nucleated red blood corpuscles of normal size were found.

Marrow.—Instead of being a deep red colour the marrow was pinkish and was softer than normal. Microscopically an increase in number of red blood corpuscles was at once apparent. The little groups in which they lie were greatly increased in size, and megaloblasts were especially numerous. The nuclei of these latter cells were very large, and frequently two large nuclei or one nucleus contracted in the middle was observed. The cells also showed in many places a central constriction, as if they were on the point of dividing. The megacarocytes were increased, and there was an enormous general cellular hyperplasia—the cells being chiefly of the amphophile type.

Lymph Glands.—Axillary, inguinal, and the higher group of mesenteric glands were enlarged, all showing general cellular hyperplasia. The cells possessing a considerable amount of peri-nuclear protoplasm, which are normal in the centre of the glands, constituted almost the entire substance of all the glands examined. In most sections a few large cells containing fragments of hæmoglobin, and occasionally entire red cells, were present.

Spleen.—The spleen was decidedly enlarged, weighing more than double the weight of the average spleen taken from normal rabbits of the same age. Microscopically the Malpighian corpuscles were unusually conspicuous, having a curiously white, anæmic appearance, and were very sharply marked out from the surrounding stroma. Microscopically also they were obviously big, but showed

no cellular change. The kidney and liver were quite normal. The thymus was not examined. Cultures from blood and spleen were negative.

Second Rabbit.—It is unnecessary to detail the changes found in this rabbit, as they were practically identical with those in the first. The blood showed a slight increase of leucocytes, the oxyphiles predominating, but no nucleated red cells were seen. The marrow changes were well marked; the axillary and inguinal glands, including a gland lying on the upper portion of the spermatic cord, were enlarged. The spleen was even larger than in the first case, and the Malpighian corpuscles were very prominent. The kidney, liver, and thymus gland were quite healthy. Cultures from blood, negative.

Third Rabbit.—This animal emaciated rapidly during the treatment, but never showed febrile symptoms.

Blood.—A differential count of the white cells gave the following result:—

Oxyphile cells	65.4	per cent.
Lymphocytes	21.6	„
Hyaline cells	11.4	„
Basophiles	1.2	„

In addition to this preponderance of oxyphile cells further qualitative changes were present. The hyaline cells were unusually large, being in fact much larger than the eosinophiles, and in most of them a large double nucleus was found. The nuclei in the small granular oxyphiles were very much broken up, appearing in the form of five or six spherical masses. Among the oxyphiles enumerated were several cells that were identical in appearance with amphophile myelocytes. No count of the blood platelets was made, but in all my preparations they appeared unusually abundant, apparently being five or six times as numerous as in normal blood. This increase of

platelets, though not so well marked, was also noticeable in the blood of the other two rabbits.

A series of blood counts showed that there was progressive, though not severe, anæmia, but no increase in number of white cells. On the day of the last injection the red cells numbered 3,100,000 per c.m., the count before the commencement of injections being 5,600,000.

Marrow.—This exhibited the same changes as in the other two rabbits, and especially an extreme cellular hyperplasia.

Lymph Glands.—The axillary and inguinal glands were enlarged; the latter especially so. They could be felt distinctly in the groin during the last two days of the treatment. Microscopically they showed cellular overgrowth, and the large cells were especially numerous.

Spleen.—The spleen was perhaps slightly above the average weight, but was not nearly so large as in the other two rabbits. The changes in the Malpighian corpuscles were well marked. They were enlarged, very conspicuous, and anæmic in appearance, and sharply delimited. At one end of the spleen the greater part of its mass was composed of fused Malpighian corpuscles, only a comparatively thin layer of circumferential cortex being left.

The liver was somewhat congested; the kidney and thymus gland were both normal.

Three rabbits were injected with the saline solution of the alcoholic residue of normal glands. One was chloroformed after ten 1 cc. injections, another after twelve injections, and the third died after the seventh. A larger number of injections could not be given owing to lack of material. All these rabbits emaciated somewhat. No blood changes were observed, and the ratio between oxyphile cells and lymphocytes was normal.

In the first a differential count gave the following numbers:—

Oxyphiles	- - -	33 per cent.
Lymphocytes	- - -	58 „
Hyaline cells	- - -	7 „
Basophiles	- - -	2 „

In only one was the marrow altered, the alteration consisting in a great increase of the megacarocytes. The axillary lymph glands, near the site of injection, were enlarged in all three and extremely congested, but no other glands were altered. In all three the spleen was unusually small and of a pinkish anæmic colour, but showed no structural alteration. In the rabbit that died naturally, much broken down hæmoglobin was scattered through the spleen substance. In this same rabbit both the liver and kidney were extremely congested, but these organs were normal in the other two. The thymus gland was normal in each case. Cultures negative.

Until a fresh supply of material is obtained my experiments cannot be proceeded with, and one reason for the publication of my results, when still so incomplete, is the hope that doing so may lead to my acquiring a fresh supply of leukæmic glands. For the present I must content myself with pointing out that the above results, as far as they go, are in accord with Flexner's in that they show that most of the hæmopoietic tissues are attacked by the same toxin. For the sake of precision, and also for the aid of future investigators, I will also draw the following tentative conclusions:—

1. A substance can be extracted from leukæmic glands by saline solution after precipitation by alcohol, which when injected into rabbits produces a marked fall in blood pressure. No depressor substance can be obtained from normal glands treated in the same way.

2. Continuous injections of the above extract into rabbits produced marked changes in their blood and hæmopoietic tissues. Some of these changes (for example, those in the bone marrow) are characteristic of simple anæmia, while others are more decidedly "leukæmic" in nature. Since these changes were caused by a comparatively few number of injections it may be hoped that more extensive alterations would result from a more prolonged subjection to treatment. No such pronounced alteration was caused by the similar extract prepared from normal glands, so it is reasonable to suppose that the leukæmic glands contain some specific substance which may possibly be the toxin which causes the disease. The comparatively rapid development of morbid changes in the rabbits experimented upon must be supposed to be due to the large quantities of toxin which were injected at each time.

My best thanks are due to Professor O'Sullivan, T.C.D.; to Professor W. H. Thompson, T.C.D.; and to Dr. J. T. Wigham, for much help and assistance in carrying out the above work.

[For discussion on this paper, see page 339, *post.*]

REMARKS ON THE PATHOLOGY OF SENILE HYPERTROPHY OF THE PROSTATE.

By R. F. TOBIN, F.R.C.S.;
Surgeon, St. Vincent's Hospital, Dublin.

[Read in the Section of Pathology, February 19, 1904.]

On the anatomy and pathology of senile hypertrophy of the prostate a flood of light has, it seems to me, been thrown by a paper of Mr. Wallace's, which appeared in the *British Medical Journal* of 30th January, 1904. In it he shows in a satisfactory manner why, although owing to its anatomical relations it is not possible to enucleate the normal prostate, it is quite easy so to treat what is called the hypertrophied prostates of old men.

Specimen No. 1.

This is due to the fact that in such case there occurs a development of adenoid growths in the gland which tend to coalesce and to form for themselves an envelope out of the remaining structures; in other words, what has to be

dealt with is an adenoid mass or masses lying in a laminated cover made out of the prostate. To this cover Mr. Wallace has given the name of the "surgical capsule," and he demonstrates that the operation known as enucleation of a hypertrophied prostate consists after the opening of the bladder in making a way for one's finger through the sheath—*i.e.*, the investment derived from the recto-vesical fascia, and containing the prostatic plexus of veins, next through one or more layers of the surgical capsule, and then shelling out the remaining unopened layers of said capsule and the adenoid growths contained therein.

Happening to have by me, when reading Mr. Wallace's paper, some recently enucleated prostates, I was able to verify for myself his remarks; and as these specimens, in addition to so doing, present some other points of interest, I beg leave to briefly call your attention to them.

Specimen No. 1 is a mass which I enucleated with great ease through the superficial layers of its surgical capsule.

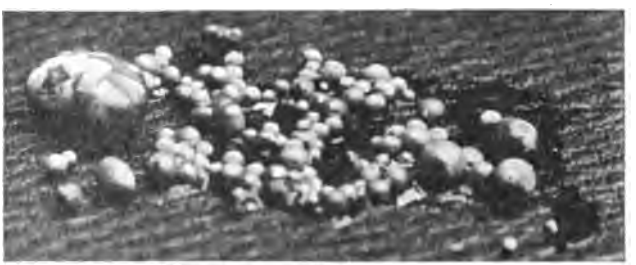
Specimen No. 2.

Specimen No. 2 is the same mass with the capsule raised and showing the layers into which it is divisible.

Specimen No. 3 shows this layer of capsule thrown back, and embedded in it can be seen adenoid growths which, of course, would have been left behind had the enucleation been conducted at this depth.

Specimen No. 3.

Specimen No. 4 shows a number of calculi which the finger came on, all at one spot, when I was operating on the case we are considering. You see that they are



Specimen No. 4.

numerous, varying in size from a grain of snipe shot to swan shot, and one is as large as a bean. The received opinion is that these calculi develop primarily in the

glandular crypts of the prostate, and that their presence in one pocket is due to an amalgamation of crypts. If this is so, the fact that the pocket was opened into while my finger was working its way through the surgical capsule points very clearly to the origin of that envelope. In the growth removed you see, open it where you may, there is no sign whatever of the existence of such bodies.

Specimen No. 5.

Specimen No. 6.

Specimens Nos. 5 and 6 show adenomatous masses embedded as it were in a fibrous capsule. But the sections of this capsule which Dr. Dargan has made for me

and placed under the microscopes before us plainly prove that its structure is not fibrous, but composed of fibro-muscular and prostatic tissue. These two specimens also show how separable are the masses from this envelope if you cut fully through it; and would incline one to try and enucleate these masses through lateral incisions carried deeply, leaving the capsule and urethra entire. A study of No. 3 specimen, however, shows that by so doing one would often leave behind in the capsule growths that might hereafter bring about a recurrence of urinary obstruction.

It is, therefore, a question of some importance whether the tear one makes in the capsule when proceeding to enucleate is a superficial or deep one.

[For discussion on this paper, see page 344, *post.*]

CONTENTS OF FEMORAL HERNIA.

By L. G. GUNN, M.D., F.R.C.S.

[Read in the Section of Pathology, February 19, 1904.]

THE case I wish to bring under your notice to-night is, I think, a somewhat unusual one, and presents certain pathological points which I hope may prove to be of interest.

Before calling your attention to the sections under the microscopes I must give you a brief history of the patient who furnished me with them. Her story is as follows:—

In 1884, just 20 years ago, Miss A., aged fifty-two, was admitted to the Adelaide Hospital, suffering from an abdominal tumour. This tumour was removed, and proved to be ovarian.

Notes in those days were not as accurately kept as they are nowadays, and I regret to say I can find no note as to any histological examination of the tumour removed.

Her recovery was rapid and uneventful.

At the beginning of 1903 Miss A. again presented herself for admission to the Adelaide, to obtain relief from a large irreducible femoral hernia.

Soon after her previous operation she noticed a small lump in her groin. Although irreducible it caused her no pain, and consequently no operative treatment was sought.

During the six months previous to her re-admission to hospital the hernia had become much larger, much harder, and the cause of a considerable amount of pain and discomfort to the patient.

Mr. Heuston (with whose permission I show the specimen) performed a radical cure, and found the following condition present:—

The sac of the hernia was greatly thickened; in places there appeared to be a new growth attached to its inner surface, and to these places the contents of the hernia, parts of the omentum, was firmly adherent. The sac was almost closed off above by a

narrow fibrous neck, to which the omentum was so closely connected that it could not be separated without tearing it away. The contents of the hernia consisted of omentum, containing numerous hard nodules, which were adherent to and seemed to be invading the sac walls.

The whole of the sac and its contents were removed at the operation.

The after-history of the case was uneventful, the most careful examination of the patient's abdomen revealing nothing abnormal.

The sections under the microscopes are from the greyish nodules in the omentum and from the thickened part of the sac wall, where the growth was attached.

Both sections show the same appearance, that of a proliferating papillomatous growth, the papillæ being covered with a rather square epithelium. There is evidence of chronic inflammatory changes, and scattered through both sections are numerous minute areas of calcification.

The characters of the growth are those of an ovarian papilloma which is proliferating and invading the surrounding tissues.

Such a growth as this could not originate in the omentum, and is most probably a transplantation growth from the ovarian tumour.

The infection of the omentum must have occurred at the time of the first operation or very soon after, as the protruded omentum seems to have been closed off from the rest of the abdominal cavity shortly after the rupture occurred.

The points about the case which strike me as being unusual are:—

1. The occurrence of a transplantation growth at a distance from and out of reach of all contact with the site of the original growth.

2. There is no sign of recurrence of the growth in the

neighbourhood of the uterus. In all the cases of recurrence of ovarian tumours after long intervals—that is, from eight or twenty years after—the growth occurred at or about the place from which the ovarian tumour had been removed.

3. The length of time (nineteen and a half years) which elapsed between the removal of the primary growth and the development of the secondary growth.

Such a period of time makes it almost impossible for us to state that any patient from whom a malignant growth has been removed is safe after several years have passed without recurrence, and seems to me to put a difficulty in the way of accepting the theory that the cause of carcinoma is the action of an organism in the growing epithelial cell.

[For discussion on this paper, see page 345, *post.*]

SECTION OF PATHOLOGY.

Friday, November 6, 1903.

THE PRESIDENT in the Chair.

DR. H. C. EARL delivered an Address on the Cytology of Serous and Serofibrinous Effusions. See page 284, *ante.*

ORBITAL TUMOUR.

MR. ARTHUR BENSON and DR. LANGFORD SYMES showed a tumour removed from the apex of the orbit of a woman, aged forty-eight. See page 308, *ante.*

MR. STORY said that the curious respiratory murmur heard over the affected orbit and its walls was to him the most interesting and obscure part of the case.

DR. TRAVERS SMITH and PROFESSOR O'SULLIVAN also spoke, and DRS. BENSON and SYMES replied.

ANEURYSMS OF CEREBRAL ARTERIES.

DR. H. C. EARL exhibited a brain with small aneurysms on various cerebral arteries.

Friday, December 4, 1903.

THE PRESIDENT in the Chair.

ÆTIOLOGY OF LEUKÆMIA.

DR. T. G. MOORHEAD read a preliminary account of some investigations which he had been making into the ætiology of leukæmia. See page 311, *ante.*

PROFESSOR MCWEENEY asked whether Dr. Moorhead had used glands from myelogenic or lymphatic leukæmia, and said that inasmuch as their pathology was different, owing to the difference in the nature of the chemiotactically active substance in each case, this was a matter of much importance. He thought the statement that the acidophiles were 65 per cent. in the experimental animal required extension as regards the coarse or fine characters of the granules. He suggested that Dr. Moorhead might in his future work enclose the material in a capsule

of elder pith, sponge, or the like, and so introduce it into the peritoneal cavity with the object of determining what classes of leucocytes were chemiotactically attracted. He concluded by congratulating Dr. Moorhead on the original and important character of his work.

PROFESSOR WHITE hoped that Dr. Moorhead would continue his valuable research, and expressed the opinion that much of the effects described were probably due to the excessive amount of nucleo-proteid to be got from the glands.

PROFESSOR SCOTT joined in the congratulations on the value of the paper. He thought that, so far from believing that the various forms of leukæmia were different, the principle of cellular intoxication might fairly be extended from the lymphatic lesions to other very cellular conditions, as sarcoma or cancer, which are also associated with blood changes, and that some common condition would be found underlying all these.

PROFESSOR O'SULLIVAN believed that chemiotaxis would not account for the cell proliferation in lymphatic leukæmia. He hoped that those present who might have an opportunity of obtaining material which would be of use for Dr. Moorhead's researches would help him, as the want of material was a great obstacle to research in Dublin.

DRS. TRAVERS SMITH, PARSONS, and H. C. EARL also spoke, and DR. MOORHEAD replied.

TUMOUR IN SKIN OF BREAST.

DR. W. S. HAUGHTON showed a tumour and its section removed from pectoral skin. This tumour clinically resembled a simple inflammation, but under the microscope revealed itself as sarcoma of deeper layers of skin, containing giant cells, small round cells, and some spindle cells.

CANCER OF RECTUM.

DR. HAUGHTON also showed a rectum, pelvic colon, and part of iliac colon removed for carcinoma recti by the double method of laparotomy and pansacral incision six weeks ago. Patient going on well. The interest in the surgical method lay in the examination of the liver and pelvic and mesenteric glands before removal, as well as the mechanical points of technique, such as arrest of hæmorrhage from supra-hæmorrhoidal and middle sacral

arteries and length of iliac meso-colon for anastomosis to anus, which was carried out. The section showed well the structure of the tumour to be a typical adeno-carcinoma of rectum extending around the lumen of the gut for more than three inches in length, without infiltration of perirectal tissues or glands, a point much to be appreciated by patient and surgeon.

ABSCESS OF THE BRAIN.

Dr. Alfred Parsons showed specimens removed from a man, aged twenty, who was admitted to the Royal City of Dublin Hospital on September 23rd, suffering from Jacksonian epilepsy. The patient, who had been previously in good health, with the exception of a chronic cough, was suddenly seized with a convulsion, and was carried into hospital during the attack. He had in all some seven or eight attacks on the day of admission. It was noticed that the lower half of the left side of his face and the left arm from the elbow down were paralysed. He had, however, no loss of power in his left leg, but the reflexes were exaggerated. The paralysis gradually increased till he had complete left hemiplegia with greatly-increased deep reflexes. He suffered also from violent paroxysms of coughing, accompanied by the most fœtid expectoration, which poured out from his mouth and nose. Physical examination revealed the presence of bronchiectasis in the lower lobe of the left lung. On September 29th Mr. Benson found the eyes perfectly normal, but three days later detected the presence of definite double optic neuritis. The headache became violent, the patient shouting out, "Oh, my head, my head," and saying the pain was like a chisel going through the back of his head. As there was no ear disease present, a diagnosis of intracranial abscess near the Rolandic area, secondary to chronic pulmonary suppuration, was made, and Mr. Johnston was asked to trephine the patient over the arm centre and explore for an abscess. This he did, but found no pus. At the autopsy the lower lobe of the left lung was found to consist of numerous bronchiectatic cavities filled with pus, and on examining the brain after hardening there was a large abscess filled with greenish pus lying directly underneath the arm centre, not more than half an inch from the cortex. The needle used in exploring must have entered the abscess cavity, but before doing so had probably become plugged with brain tissue,

CANCER OF BREAST WITH SECONDARY GROWTHS IN OVARIES.

DR. J. T. WIGHAM showed a cancer of the breast, and various internal organs secondarily affected, with sections. The cancer was of the ordinary type of scirrhus, and was well marked, the interest in the case lying in the route by which the disease had spread to the internal organs. The breast was removed surgically, and some two months afterwards the patient showed signs of secondary growths internally, and rapidly died. As the *post-mortem* was not made until some three months after the operation, the connection between the breast and the pleura could not be established with any certainty, but beyond that it was obvious that the greater part of the internal organs affected had formed secondary growths by direct continuity. Cancer nodules could be discovered in the liver and under the pleura, pericardium and endocardium, and sections showed the growth pushing through the heart fibres between the two last. Similar growths were also found in both ovaries and along the course of the Fallopian tubes, while the peritoneum was quite free, and no other cancer masses were discovered below the level of the liver. This curious connection between the breast and the ovaries had been remarked before, but is nevertheless interesting.

Friday, January 15, 1904.

THE PRESIDENT in the Chair.

HORSE-SHOE KIDNEYS.

DRS. H. C. EARL and TRAVERS SMITH showed tuberculous suprarenal bodies and a horse-shoe kidney from a case of Addison's disease. The former also exhibited a second horse-shoe kidney.

PROFESSOR MCWEENEY said out of many hundreds of autopsies which he had made he found but one horse-shoe kidney, which was situated much lower down than usual; in fact, the connecting isthmus lay over the sacro-iliac synchondrosis.

DEFORMITY OF LIVER.

DR. H. C. EARL showed a liver with deformity, probably produced by tight-lacing. A portion of the right lobe close to

the right side of the gall-bladder was turned right over so as to come in contact with the upper surface of the liver.

PARAFFIN METHOD OF EMBEDDING.

PROFESSOR MCWEENEY showed an adaptation of the paraffin method of embedding tissues suitable for class purposes. The sections were cut in chains, floated off in convenient lengths as usual, and taken up on thin sheets of mica, to which they were caused to adhere by capillary attraction. The mica sheets were cut up, and the divisions, each bearing a section, given out to the class. After removal of the paraffin as usual, the students stained and mounted the sections, which adhered throughout to the mica, and were mounted in balsam along with it. The exhibitor owed his acquaintance with this useful method to his friend Professor Coffey, who had acquired it in Held's laboratory.

RINGWORM.

PROFESSOR MCWEENEY showed sections of ringworm hairs prepared by the paraffin method, and adapted by the mica method for distribution to a class. They showed the characters of the several forms of ringworm, especially the microsporon, and their relation to the hair shaft and root sheath. The microsporon spores in the Irish cases he had studied gave notably larger measurements than those usually recorded—4 to 6 mikra, instead of 2 to 3 mikra as generally given. He also showed young microsporon plants grown from single spores on "French proof agar," as well as in epidermic scales. The acladium form of branching and ectospore formation were well seen in the hanging drop cultures. For staining, he had found Heidenhain's iron-hæmatoxylene after formol-vapour fixation most useful. The nuclei of the young mycelium were well seen under high powers. He had it in contemplation to undertake a comparative study of Irish skin-fungi by the methods he now outlined—viz., isolation of individual spores and culture on French proof agar.

ENDOMETRITIS.

DR. NEVILLE exhibited photographs made by Dr. Wigham of various varieties of endometritis.

CANCER OF OVARY.

DR. NEVILLE showed macroscopic and microscopic sections of cancer of the ovary.

Friday, February 19, 1904.

THE PRESIDENT in the Chair.

POINTS IN THE PATHOLOGY OF SENILE HYPERTROPHY OF THE PROSTATE.

MR. TOBIN brought forward this subject. See page 331, *ante*.

DR. DARGAN stated that the sections shown were made from the very outermost laminated layers of what seemed to be merely a fibrous envelope to the growth. They showed here and there atrophic glandular spaces lined in many cases by cubical cells, but greatly compressed, and evidently undergoing involution. The presumption is that these are derived from greatly compressed prostatic tissue.

PROFESSOR WHITE stated that he was quite certain that a few, at least, of the cases of senile enlargements of the prostate were true hypertrophies.

DR. H. C. EARL said that he agreed that senile enlargement of the prostate was of a glandular nature. He had not always been able to find glandular or muscular tissue in the fragment of tissue adhering to the prostates removed by operation. In a number of examinations he had only once found a small myoma. He mentioned a case of prostatic obstruction due to a cyst in the left lobe

MR. TOBIN, in replying to the remarks of Dr. Earl, who disputed Mr. Wallace's views, said that most of the cases that he had examined were either true hypertrophies of the prostate or adenomata in the prostate, but which did not convert it into a capsule. Mr. Tobin asked, What, then, of the capsule that cerexists in all cases of senile hypertrophy ? He had never failed to shell out the offending mass in such cases, but he had always utterly failed to shell out a tuberculous prostate in the operating theatre or a normal prostate in the dissecting room.

ENDOTHELIOMA OF THE PERITONEUM.

MR. L. G. GUNN showed a case of endothelioma of the peritoneum occurring in a man, aged twenty-eight, with extensive secondary growths in the lung, liver, and bronchial glands.

MR. BENNETT asked whether the primary growth had been found, as all the growths shown seemed to be secondary.

MR. GUNN replied that the most careful search for a primary lesion had failed, and, acting on the presumption that the growth had originated from the peritoneum itself, it had been labelled an endothelioma.

IMPLANTATION (OVARIAN) TUMOURS.

MR. L. G. GUNN showed a femoral hernia, in which a distinct secondary ovarian growth had occurred. The ovarian tumour had been removed nineteen years before. The hernia had enlarged for a few months before. See page 336, *ante*.

DR. NEVILLE exhibited a transplantation cystic tumour from the scar of an old (five years) ovariotomy. The tumour shown was about the size of an ordinary fist, and consisted of a congeries of small cysts, approximating twenty in number, varying in size from that of a pea to that of a large walnut. Microscopic examination showed a marked resemblance between the peculiar epithelium lining of each cyst and that constantly found in Graafian follicles, the so-called membrana granulosa, specimens of which were shown. It was, of course, impossible to rely very certainly upon such a resemblance in the absence of any other explanation.

PROFESSOR WHITE found some difficulty, owing to the amount of calcification, as shown by the sections under the microscope, in believing that the transplanted ovarian papilloma had recently been actively growing, and wished to know Mr. Gunn's opinion on that point.

MR. GUNN replied that, in his opinion, most of the enlargement was due to the growth within the omentum, and not from any fresh omentum coming down into the sac.

DOUBLE-SIDED DERMOID CYSTS.

DR. NEVILLE exhibited tumours which were removed from a patient, aged twenty-five, in the Rotunda Hospital, by the Master, Dr. E. Tweedy, and remarkable for the marked differences

of the two tumours. One—the smaller one—was an ordinary dermoid, in size about that of a fœtal head, and consisting mainly of two cysts, a considerable portion of the inner surface of which was lined by skin, covered with white hairs. But the larger tumour, rounded, smooth, and measuring eleven inches by eight inches, was essentially a solid tumour, presenting on section a very peculiarly variegated surface, with occasional small cysts, few of which, however, were larger than a walnut. Some of these quite small cysts were partially lined by skin and hair. The solidity and malignant appearance of the growth had at first suggested that it might prove to be a teratoma on microscopical examination. This showed, however, the general appearance of a cystic adenoma, the epithelium lining of the cysts being mostly composed of goblet cells. Sections of the skin cysts had not yet been made, but Dr. Neville was convinced that the tumour really consisted of a very unusual and very solid form of dermoid cystadenoma.

TERATOMA.

Dr. H. C. Earl showed a teratoid tumour of the ovary. It was taken from a young woman, who died with abdominal symptoms some months after its removal. Sections taken from different parts of the tumour showed small cavities lined by epidermis, and having hairs and sebaceous glands in their walls. Other cavities were found to be lined with a columnar epithelium and glands resembling Lieberkühn's crypts opened into them. Bone, cartilage, masses of pigmented cells, adipose tissue, and tissue resembling that of the central nervous system were also found, as well as groups of ganglionic nerve cells.

CALCIFIED FIBRO-MYOMA.

Dr. Neville exhibited a completely calcified fibro-myoma of the uterus, removed, with other non-calcified fibro-myomata, by Dr. L. Kidd, of Enniskillen. Tumours so completely calcified were certainly rare in connection with hospital practice, though not uncommonly found in connection with anatomical schools.

Mr. Bennett related a case which he saw several years ago, in which a calcified myoma ulcerated into the bladder, and was diagnosticated as stone. In the attempt to remove it the patient died. The true nature of the mass was only discovered years afterwards.

Friday, March 18, 1904.

THE PRESIDENT in the Chair.

SUBCUTANEOUS ENDOTHELIOMA.

MR. E. H. TAYLOR and DR. O'SULLIVAN exhibited a tumour from the leg of a man, aged forty-two, which had originated a year previously in a mole. The tumour, which was attached by a pedicle, was pigmented, and had grown very rapidly. The glands in the inguinal region and in the iliac fossa were large and hard. Dr. O'Sullivan demonstrated microscopic preparations from various portions of the tumour. It showed, near the periphery, spaces lined by a single layer of high cubical cells separated from blood-vessels by hyaline connective tissue. In a deeper portion the cells, several layers deep, had encroached on this connective tissue and formed a sort of outside sheath to the vessels. The main part of the growth consisted of solid columns of cells separated from one another by a fine fibrous stroma. These cells showed very numerous mitoses. The pigment was confined to the stroma.

DR. O'SULLIVAN considered the tumour to be an endothelioma growing from the lymph spaces in the subcutaneous tissue.

DR. H. C. EARL discussed the paper.

KIDNEY TUMOURS.

MR. L. G. GUNN showed two tumours from kidneys of different subjects. One, which he called a sarcoma, showed large round cells invading the kidney substance. He discussed the possibility of the tumour being a carcinoma of the suprarenal capsule. The second tumour showed a firm cystic structure with a papillary growth extending into and dilating the ureter.

DRS. EARL and O'SULLIVAN spoke.

SECTION OF STATE MEDICINE.

SOME PUBLIC HEALTH PROBLEMS IN IRELAND.

By SIR JOHN W. MOORE, M.D., D.P.H. (Univ. Dubl.);
Fellow of the Royal College of Physicians of Ireland;
President of the Section of State Medicine.

[Presidential Address delivered in the Section of State Medicine, February 12, 1904.]

INTRODUCTORY.

For the third time I have been called to preside over *this* Section of the Royal Academy of Medicine in Ireland. It is hardly necessary to say that I look upon such a mark of confidence as a very signal and gratifying compliment, of which I may well be proud, and for which I return you my most hearty thanks.

On February 5, 1885, I addressed this Section—or, as it was then, Sub-section—of the Academy on "Sanitary Organisation in Ireland in its Medical Aspect." Two years later, on February 3, 1887, the subject of my Inaugural Address was "The Present and the Future of State Medicine."

In the seventeen years, which have passed away since *the* latter date, State Medicine has made unexampled progress in all its departments—Sanitary Organisation in Ireland, on the contrary, has advanced "with halting steps and slow." Yet substantial advance has taken place in many directions even in this country.

NOTIFICATION.

In 1887 I had to deplore an uncompromising opposition to the principle of Compulsory Notification of Infectious Diseases on the part of the vast majority of the Medical Profession. On the 30th of August, 1889, an "Act to provide for the Notification of Infectious Diseases to Local Authorities" (52 & 53 Vic., chapter 72), received the Royal Assent at the hands of Queen Victoria, most revered and best beloved of British Monarchs. All opposition to the principle of notification has long since happily died out, and the Act has now been adopted practically throughout the length and breadth of the land, with untold benefit to the public health.

The provisions of the "Infectious Diseases (Notification) Act, 1889," are too well known to the Fellows and Members of the Academy to need any explanation at my hands. I may, however, refer to a useful application of the Act, whereby comparatively trivial infections which simulate more serious maladies, like chicken-pox in its relation to small-pox, or rubella in its relation to measles or scarlatina, are temporarily added to the schedule of notifiable diseases when the more deadly infections threaten to be, or are, epidemic.

On August 4, 1890, an "Act to prevent the Spread of Infectious Disease" (53 & 54 Vict., chapter 34), shortly called the "Infectious Disease (Prevention) Act, 1890," was put upon the Statute Book, with the object of enabling sanitary authorities to give practical effect to preventive measures based on information obtained through notification.

These two measures—the Magna Charta of Public Health—passed by an enlightened Legislature, have been cordially received and worked by the Medical Profession,

who with a noble self-denial have once more admitted the truth of the adage—"*Salus Populi, suprema Lex.*"

QUALIFICATIONS IN PUBLIC HEALTH.

A second great advance has been the official recognition of Diplomas in State Medicine or Public Health. The initial step had been taken in 1886, when the Medical Act (49 & 50 Vict., chapter 48), by its twenty-first section, provided for the registration by the General Medical Council of "Diplomas in Sanitary Science." Since January 1, 1892, the Medical Officer of Health of a county, district or combination of districts with a population of 50,000 or upwards, must, in addition to his qualifications in medicine, surgery and midwifery, be registered as the holder of a Diploma in Sanitary Science, Public Health, or State Medicine under Section 21 of the Medical Act of 1886. It is gratifying also to note how many officers in the Naval, Military and Indian Medical Services are taking this higher qualification. In my Address to this Section in 1887, I recalled the fact that to the University of Dublin belongs the credit of having been the very first institution in the United Kingdom to establish a Diploma in State Medicine, or (as it is now called) "Public Health." The first examination for the Diploma took place in June, 1871—nearly three and thirty years ago—when it was granted to Dr. Arthur Wynne Foot, Dr. Gerald Francis Yeo, Dr. John Todhunter, and myself.

TUBERCULOSIS AND ITS PREVENTION.

A notable contribution to the literature of this all-important question has very recently been published. I refer to an article in *Tuberculosis* for January, 1904, on "The Present Position of the Tuberculosis Problem in Ireland," by Dr. Alfred E. Boyd, Honorary Secretary of the Dublin Branch of the National Association for the

Prevention of Consumption and other Forms of Tuberculosis. Dr. Boyd shows by figures taken from the Annual Report of the Registrar-General for Ireland for 1902 that the deaths from tuberculosis in Ireland in that year were 11,837, against 12,335 in 1901, and an average of 12,716 in the ten years 1891-1900. Phthisis, or pulmonary consumption, was responsible for 9,400 deaths in 1902. The highest county death-rates for tuberculosis in general for the same year are—Dublin County Borough, 4.7 per 1,000 of the population annually; Belfast County Borough, 4.0; Dublin County, 3.5; Cork County and Cork Borough, 3.0. The lowest rates are—Cavan, 1.5; Roscommon, 1.6; Mayo, Fermanagh, Longford and Donegal, each 1.7.

For the whole country the deaths in 1902 represent an annual death-rate of 2.7 per 1,000 of the population—the lowest rate recorded in Ireland since 1896. Commenting on these figures, Dr. Boyd observes: "The upward tendency, which during recent years has caused grave anxiety, has thus been checked, and there is ground for hope that ere long there will be a substantial decrease in the prevalence of tuberculous disease in Ireland."

Having described what has already been done in Dublin to cope with the evil, Dr. Boyd sets forth the chief measures still required in order to control tuberculosis in the metropolitan district as follows:—

1. The extension and development of existing institutions for the isolation of the incurable and for the treatment of patients in the early stages of consumption.

2. The provision of public bacteriological laboratories.

3. Compulsory notification of phthisis.

4. The instruction of all consumptives and the periodical disinfection of their houses by the local authorities.

5. The prevention of spitting in public vehicles and thoroughfares.

6. The instruction of the young in schools in the principles of general hygiene, and in the special means which may be adopted to prevent tuberculosis.

It seems to me that some such scheme as the following should be carried out with the view of checking the awful ravages of consumption in this country:—

I. The rise and spread of tuberculosis in the cottage homes of the peasantry and in town dwellings must be grappled with by—

1. Notification, which should be compulsory.
2. Verification of the diagnosis by means of bacteriological examination of the sputum, &c.
3. Removal of the patients to "hospital," using the term in its fullest sense.
4. Periodic inspection of the homes of the tuberculous.
5. Periodic disinfection of those homes.

II. The provision of "hospital accommodation" for—

1. Early cases, with a view to cure.
2. Advanced cases, to provide comfort for the dying, and to secure safety for the living.

[The expression "Hospital Accommodation" should include "isolation hospitals," "sanatoriums," "consumption wards," and hospices for the dying.]

III. The vigorous and absolute segregation of tubercular cases in workhouses, asylums, and other public institutions.

IV. Education of the public in all matters relating to the prevention and management of pulmonary tuberculosis.

V. Improvement of the housing of the working classes and of the very poor, especially in towns.

THE HOUSING OF THE POOR.

Closely connected with the prevention of tuberculosis is the question of the housing of the working classes and of the very poor—a very burning question in Dublin of late years. It will be within the recollection of the Fellows of the Royal Academy of Medicine in Ireland that in 1900 the Local Government Board for Ireland appointed a Committee to inquire into the public health of the City of Dublin. In their Report, dated May 14, 1900, the Members of that Committee made special allusion to the insanitary circumstances in which a considerable proportion of the population of Dublin lives. "Large tenement houses, each room occupied by a separate family; the house itself in a state of dilapidation; water supply inconvenient of access; dirty common stair-cases; inadequate water-closet accommodation in a foul state; back yards ill-paved and littered with refuse and excrement, are conditions of life in Dublin which are frequently encountered in connection with the dwellings of the poorer classes." The Committee point out that these conditions tend to produce a state of lowered vitality favourable to the contraction of disease, and to a fatal result of disease when contracted. They also directly encourage the spread of infective maladies, including phthisis and other forms of tuberculosis, which are excessively prevalent in a fatal form in Dublin. Strict cleanliness in the home is of the first importance in checking the spread of consumption, and cleanliness finds no place in most of the houses occupied by the Dublin poor. And, in this connection it has to be borne in mind that the proportional amount of poverty in Dublin is very large, so that the unfavourable conditions associated with the houses of the poor are widely spread throughout the city.

The very first measure for improving the health of

Dublin recommended by the Committee refers to tenement houses. It is pointed out in the Report that any improvements in these numerous and widely scattered insanitary dwellings must react favourably on the health of the city. The walls and structural parts of many of the large houses, which were formerly the residences of only one family each, but which are now occupied by a number of separate families, are in fairly good order. But the structural conditions of many tenement houses more recently built are much less favourable. In the inadequacy of sanitary accommodation for these houses, danger to public health also arises.

The Committee go on to state that "the question of the housing of the poor of Dublin is one of magnitude. The provision of an adequate number of healthy dwellings by way of relief for the present overcrowding of population under unhealthy conditions in congested districts of the city must, of necessity, be on a considerable scale, and would probably involve several schemes for this purpose. Accordingly, in schemes for the provision of dwellings for the poor, there would be advantage in selecting sites in neighbourhoods less densely populated than those now inhabited by the class for which such provision should be made. These sites could best be obtained outside the city, in localities within easy access of the principal business quarters of Dublin. In these schemes it should be borne in mind that healthy dwellings are especially needed in Dublin for the very poor. Houses, therefore, intended with this object should be of the plainest kind, in order that such schemes may not entail heavy loss upon the ratepayers."

As to this last point, we must remember that anything which will reduce the liability to epidemic disease will be a direct saving to the ratepayers. It was calculated that

the small-pox outbreak of 1878 cost the City of Dublin not less than twenty thousand pounds sterling.

In the paper from which I have already quoted Dr. Boyd points out that much has been done, and is being done, in Dublin to mitigate the evil of overcrowding. The Dublin Artisans' Dwellings Company, the Iveagh Trust, and the Corporation of Dublin, "have erected modern buildings on sites which were formerly covered by houses in which sanitation was too often primitive, and in which healthy existence was almost impossible; while the Association for the Housing of the Very Poor, the Social Service Tenements Company, and the Alexandra Guild have, in a smaller way, attacked the problem by buying buildings which were capable of renovation, rendering them sanitary, and letting them to the poor at rents which cover expenses, and in some cases allow of a small rate of interest being paid on the capital invested." The Social Service Tenements Company is worked by students and others connected with Trinity College, Dublin. The Alexandra Guild is connected with the Alexandra College, Dublin, an institution for the higher education of women. The Urban District Councils of Rathmines, Pembroke, Kingstown and Blackrock are also engaged in extensive building operations for the better housing of the working classes and the poor. In the very heart of the city the space between the ancient Cathedrals of Christ Church and St. Patrick has, within the past few years, been changed as by a magician's hand. A charming park and wide, well-paved streets, with airy, well-built houses, have taken the place of squalid lanes and alleys, reeking with filth and hot-beds of disease—typical "fever-nests," such as were so graphically described by the late ever-to-be-lamented philanthropist and sanitarian, Dr. Thomas W. Grimshaw, C.B., Registrar-General for Ireland. In many other

districts also, both north and south of the River Liffey, wholesome homes for the industrious working classes have sprung up under the auspices of the Dublin Artisans' Dwellings Company. "Old Dublin" is, in fact, rapidly disappearing and with it typhus fever has already well nigh disappeared.

WORKHOUSE REFORM.

I wonder whether at the present time a single champion of the existing Poor Law system of Ireland could anywhere be found.

In the first place universal suffrage and the Local Government (Ireland) Act of 1900 have flooded the Boards of Guardians all over the country with "representatives" of the sovereign Plebs. In many instances these men are, from the accident of their birth, social position, calling and education, incapable, however well-meaning they may be, of discharging their duties to the poor and infirm in an enlightened, philanthropic spirit, untrammelled by political and sectarian considerations. A single instance by way of illustration must suffice:—The Medical Officer of Granard Workhouse—himself a Roman Catholic—complained that his patients were not being properly nursed. The nurses were Nuns, the rules of whose Sisterhood forbad them carrying out certain details of sick nursing. What was the result? The Sisters resign. The Bishop of the Diocese espouses their quarrel. An unseemly wrangle between the Local Government Board and the Guardians ensues, and drags on for months. The Bishop insists on an apology to the Nuns by the Medical Officer, who did nothing more than his duty. And so the interests of the sick poor are wantonly sacrificed.

But matters are even worse when we come to consider

the internal economy of the workhouses of our land. As it exists, it is a grave scandal and a national disgrace.

The "workhouse system," says Miss Emily Buchanan (herself a Poor Law Guardian) in a paper read by her before the Philanthropic Reform Association on September 22, 1903, "is unjust and distasteful to the sick and helpless classes, and is only too attractive to the undeserving, who thrive upon its corruptions. In no other country in Europe, outside the United Kingdom, is such a system to be found."

People of all ages and of both sexes are massed together in institutions where, contrary to the Law of Nature, they are supplied with the necessaries of life without the trouble of working to obtain them. The sick poor who enter the workhouse hospitals become ordinary pauper inmates of the workhouse if they do not leave at once when convalescent. Sane epileptics drift from the union hospital into the lunatic wards. Imbeciles and the harmless insane are found in nearly all the workhouses of Ireland. Respectable old people are housed with the unworthy, the dissolute, and the degraded. But it is the young children who are in the most wretched case. Born, it may be, and bred in the workhouse and its squalid surroundings, what hope is there that pauper children will make good citizens of the State in after-life? Surely their pitiable condition calls loudly for redress. Reform should proceed on some such lines as the following:—

1. All children should be boarded out, and properly educated.

2. The respectable aged poor should also be boarded out. In Denmark there are asylums apart from the workhouses for the reception of old men and old women, who, through no fault of character, but by reason of advancing years and failing powers, have been reduced to penury. In these

asylums they find a comfortable home and retain their self-respect.

3. No lunatics or epileptics should be admitted to the workhouse. This is the law in England and Scotland.

4. The union hospital or infirmary should be entirely separate from the workhouse; nor should the hospital patients be drafted into the workhouse when convalescent.

5. It is desirable that women inspectors should be appointed under the Local Government Board. The principle of such an appointment has already been admitted in regard to boarded-out children. To the Irish Workhouse Association, headed by its noble President, Lord Monteagle, is due the credit of initiating this great reform.

6. The employment of fully-trained nurses should be compulsory on all Boards of Guardians.

These are some of the lines along which Poor Law Reform should move.

It will be objected that all this means expense and a raising of the Poor Rates. Even if it did, the welfare of the poor outweighs the silver and gold. But a vast improvement in the directions indicated can be achieved at a comparatively slight cost, provided retrenchment is effected in other directions. I have heard it alleged—I cannot vouch for the correctness of the statement—that, of the Poor Rates, 60 per cent. is spent on salaries, and only 40 per cent. on the poor!

THE POOR LAW MEDICAL SERVICE.

At last—after long years of unaccountable apathy—the Medical Profession appears to be awaking to a sense of the grave and most unsatisfactory state of what may be called "The Home Medical Service." The lot of the average dispensary medical officer in Ireland is, of a truth, not an enviable one. Overworked and underpaid, at the beck and

call of masters whose views as to his duties and their rights are not always controlled by that "sweet reasonableness" which is begotten of a liberal education and a ripe experience of the world; hampered in his ministrations to the sick by official book-keeping; with no prospect of promotion after years of toil and drudgery; face to face with the conviction that he must die in harness, or run the risk of retirement without pension or "superannuation"—what a calling is this for a member of a "Learned Profession!"

It is, however, in the aspect of the question which bears on the sanitary organisation of the country that the interest of the State Medicine Section of the Royal Academy mainly centres. The members of the Section will remember that every dispensary medical officer is *ipso facto* medical officer of health for his dispensary district. He is *obliged* to perform many and onerous duties, which are specified in detail in an order to sanitary authorities issued by the Local Government Board under the Public Health Act of 1878. Additional duties have been imposed upon him by subsequent Acts of Parliament, such as the Labourers' Dwellings Acts of 1890 and 1893; the Infectious Disease Notification Act, 1899; the Infectious Disease (Prevention) Act, 1889; the Public Health Amendment Acts of 1884 and 1885; the Housing of the Working Classes Act of 1903; and the Local Government (Ireland) Act of 1898.

For these multifarious and highly-responsible duties a shamefully inadequate remuneration has been fixed at the instigation, and with the approval, of the Local Government Board for Ireland. The Sanitary Authorities are no doubt to blame for having so grievously misjudged the value of skilled services rendered to Preventive Medicine by the local medical officers of health; but the chief fault lies at the door of the central controlling authority—the

Local Government Board—which should have refused to sanction mere nominal salaries to the medical officers of health, whose duties were bound to be anything but nominal unless the administration of the public health code in Ireland was to be a sham.

As has been already stated, in the year 1900 the Local Government Board for Ireland appointed a Committee to inquire into the public health of the City of Dublin. I had the honour to serve on that Committee, and I need not say with what deep regret I felt bound, after hearing an immense mass of evidence, to subscribe to the following finding of the Committee:—"The evidence laid before us leads to the belief that the provision of Section 11 of the Public Health (Ireland) Act, 1878, whereby each Dispensary Medical Officer is obliged to act as Medical Officer of Health for his Dispensary District, has worked unsatisfactorily in Dublin, and should be altered."

Let me not be misunderstood. The Committee found no fault with the way in which the duties of medical officer of health had been discharged by the sixteen dispensary medical officers of the City of Dublin districts. Quite the contrary. Their conduct has been on all occasions most praiseworthy, self-denying and devoted. But their executive power existed only in name; they could do little more than report; they were little better than "sanitary subofficers"—to quote the ridiculous nomenclature of the eleventh section of the Public Health Act of 1878; the many claims upon their time as district physicians curtailed their usefulness as health officers.

Effect, however, has not been given to the recommendation of the Committee that the public health duties of the dispensary medical officers "should be discharged by an assistant medical officer of health, who should receive an adequate salary, and who should give his whole time to

the duties of his office." In Dublin, as throughout Ireland, the dispensary medical officers remain the medical officers of health for their respective districts, and what I now contend for is that this hard-worked, badly-requited body of public servants, whose efforts for the health and welfare of the community are often misunderstood, seldom, if ever, appreciated, should be properly recompensed for their services under the Public Health Acts. If this is done, and if the suggestions for the betterment of the health of the people made by the local medical officers are carried out intelligently and in a generous spirit, the dawn of a brighter day for the Irish race will at last be near at hand.

THE ATTITUDE OF OUR PROFESSION TOWARDS THE EDUCATIONAL QUESTION IN THESE COUNTRIES.

By R. B. M'VITTIE, M.D.

[Read in the Section of State Medicine, February 12, 1904.]

Having been much struck by the extraordinary progress made by Denmark, Sweden, and Germany in the last few years, and finding upon investigation that it is mainly due to the control exercised over primary education by the medical profession, I have taken the liberty of bringing my views before the Academy, hoping that we may be aroused in these countries to assert ourselves more energetically in this matter, and do something to shake off the fetters of antiquated precedent which paralyses us, so that we may make the intelligence and physical energy with which our people are naturally gifted a more effective power in the world.

Now, in order that we may understand each other more clearly we must, first, come to some agreement as to what we mean by education; secondly, we will consider the creature to be educated; and finally we will see in what relationship these investigations stand to our method, and to those which experience indicates have been most successful elsewhere.

In the present day we are always hearing about education, but it is surprising how few people you can find who would attempt to explain what they mean by it. Some would tell you that it meant going to school and college, some that it meant passing examinations and getting degrees, while others, taking the derivation of the word, would tell you that it was the drawing out the qualities that are latent in the individual.

Now, none of these explanations are quite satisfactory, for although the last is probably the nearest to the truth, yet it does not fully satisfy the requirements of modern times, inasmuch as we not only want to bring out the faculties of the individual, but also to develop him in such a manner that by the use of what he already possesses he may acquire more. Some people may say that it is impossible to develop in an individual a faculty that he does not already possess; but this is manifestly incorrect, for a person who is deaf and dumb cannot be said to possess the faculty of speech, yet by the use of the powers of sight and muscular sense he can, by a little ingenuity and training, be taught to speak very well indeed. It is therefore evident that by the use of two or more faculties we may acquire others, and as this capacity for acquisition implies development and energy, it would indicate what, to my mind, is education in the true sense.

The great aim and object of all education should be to enable us to give due value to all the factors in the various complex problems of daily life, so that we may arrive at a correct conclusion and be enabled to devise efficient means for dealing with the difficulties of the situation as they arise.

In the simple problem of the parallelogram of forces it is demonstrated that when any two forces acting at a given angle about a point are represented in direction and extent by two sides of a parallelogram the resultant of those two forces will be equal in direction and extent to the diagonal of that parallelogram. You will remember that if undue value be given to either of these forces, or the angle at which they operate is incorrect, the resultant must necessarily be incorrect also. And we think it will be conceded that in a similar manner, when taking a forecast of the various complex positions of daily life, our judgment can only be found to prove itself correct when our estimate of the importance of the various factors concerned has also been correct. To

make more clear what I mean perhaps I may be allowed to take an illustration :—

If I ask you what I hold in my hand, you will say an apple, but if I strike it upon the desk you will say that it is not the sound you would expect an apple to give. If you smell it, it does not smell like an apple ; if you grasp it, it seems heavier and harder than an apple. You will therefore come to the conclusion it is not an apple at all, and in this you will be correct. It is only a paper weight made to resemble an apple.

It will be plain, therefore, that we fell into error by giving undue value to the factors of colour and shape in this case; but when we call into play the corrective powers of the other nerve centres by which we appreciate the remaining factors of touch, weight, sound, and smell, in due proportion, we see that our first estimate is incorrect, and as the resultant of all these observations we conclude that this is not an apple at all, and in this we are right.

Matthew Arnold shows that he appreciates the necessity for this combination of different mental powers in the production of sound judgment when he says that Joubert, when writing on Voltaire and Rousseau, " has the faculty of judging with all the powers of his mind and soul at work together in due combination, and how rare is this faculty."

This faculty of testing or allotting to our various observations their due relationship is the underlying principle of geometrical science.

Geometrical science, by dealing with the relationship of proportions, enables us to arrive at equilibrium, and as equilibrium is the physical equivalent of the moral ideal of justice and equity it follows that a physical training which develops those faculties and senses which enable us to estimate this relationship of proportion must have a far-reaching influence upon our mental and moral natures.

Civilisation is the result of a progressive, selective appropriativeness, and progressive, selective appropriativeness can only be brought about by an appreciation of the relationship of proportions. Hence our civilisation is directly due, whether we recognise it or not, to our appreciation of the relationship of proportion; in other words, to the "fitness of things" physical, mental, and moral.

The locomotive steam engine is perhaps the best concrete example of modern progressive civilisation, and a moment's reflection will be sufficient to show that its efficiency depends upon the accuracy with which the proportions of the details are carried out. The size of the cranks must be proportionate to the length of the stroke of the piston. The capacity of the boiler must be proportionate to the steam which will be required; while, finally, no matter how powerful and well-constructed the engine itself may be, the solidity of the road must be proportionate to its weight, or it will sink in the ground and become perfectly useless.

Our principal aim, then, in education will be to give such uniform development to all the faculties, both physical and mental, as may enable us to assign due value to the various factors of the problems of daily life.

It is, in fact, a departure from this appreciation of the relationship of proportions which constitutes insanity, and, on the other hand, that community which orders the mechanical duties of its daily life with the greatest geometrical accuracy and its moral relationships with justice and equity will certainly hold a leading position amongst the nations of the earth.

If, then, we are agreed upon the fundamental principles which should control our educational aims we must next consider, as briefly as possible, the leading characteristics of the creature to be educated.

Man is a compound being, and hence his development must

necessitate the development of his component parts. It may be impossible to attain to perfection, but, nevertheless, we must aim at it, and to insure the perfection of a compound we must begin by selecting perfect elements. A man who is morally and mentally as near perfection as possible cannot be said to be a perfect man if he is physically diseased, for although his moral and mental characteristics are undoubtedly much more useful and to be admired than his physical, yet the physical are necessary for the maintenance of the moral and mental, and the physical deterioration must inevitably be followed by dissolution, or at all events decline, in the moral and mental usefulness of the sufferer. Let us take the analogy of a fruit tree; its highest function is to bear fruit, but in order that it may do so it is necessary that its roots and leaves and branches be healthy, as otherwise it cannot continue to bear good fruit. It cannot be said to be a well-developed tree simply because it bears a large quantity of fruit for one or two years, and then fades and dies. In order that the tree may deserve the character of a perfect tree there must be a due proportion between all its component parts, which may result in the greatest possible amount of the best possible fruit. The roots, the branches and the leaves are not the object for which the fruit tree is cultivated, but they are necessary to it, and similarly the physical and mental qualities of man are not the highest objects of his existence, but are most useful to maintain and give effect to those moral qualities by which alone man may reasonably hope to glorify his Creator and benefit his fellowman.

Deuteronomy tells us "the blood is the life," and modern science has not been able to dispute this simple statement. We may therefore take it as conceded that the first essential for physical development is a sufficient quantity of healthy blood, and hence that the question of how we are most likely to procure healthy blood must be dealt with at the outset.

I think it was Oliver Wendell Holmes who said that in order to be healthy we should go back a few hundred years and procure healthy ancestors. This would no doubt be excellent, but as it is impossible we must only accept things as they are and make the best we can of people as we find them. This part of the question therefore narrows itself down to the consideration of the circumstances which are most likely to assist us in maintaining our blood in a healthy condition or improving it, should it have undergone deterioration, and this will naturally suggest the investigation of the sources from which the blood is derived.

For all practical purposes and to avoid too many technicalities we may define the sources of blood-formation as threefold :—

1st. The digestion and assimilation of the food taken.

2nd. The respiratory process.

3rd. Nervous influence which presides over all tissue-formation or change.

It is therefore necessary that the food be good, and that the digestive and assimilative process be effectively carried out; secondly, that the air breathed be sufficient in quantity and good in quality ; and, thirdly, that the nervous influences in operation during the other two processes of digestion and respiration be such as are calculated not only not to hinder, but to further, the exceedingly delicate and intricate tissue changes which are necessary for the production of blood, efficient in quality and sufficient in quantity.

It will therefore be desirable when we seek the development of an individual to place him under such favourable circumstances that we may reasonably hope that all the processes above alluded to may be duly balanced and maintained, and that just as we saw in the example of the tree, that the leaves and branches and roots in due proportion exercised their influence in attaining the end in view, so it will be necessary

that the digestive, respiratory and nervous processes should be maintained in a condition of integrity by the exercise of various accessory forces throughout the system, such as the glands, the skin and the muscles.

The physical and mental powers must be patiently and solidly built up, or they will not be able to sustain the moral equilibrium under the pressure of temptation or disease, and hence much that is noble and excellent in the culmination of this most imposing edifice collapses in chaotic ruin ere the finishing touches could be given to the masterpiece, and we find too often, far too often, the hoary head which should teach us wisdom a painful spectacle of despondent decrepitude or blank and incoherent dementia.

Let us now for a moment glance at the daily life of the average school child and see what steps we are taking to bring about the development of these component factors which are necessary for the maintenance and progress of our people.

We will take a child of 9 or 10 years who lives in a single room in a tenement house. His mother is still a young woman, who learned geography and grammar and kindred subjects at school, but never got a lesson in cooking in her life, has never heard anything of the comparative value of different kinds of foods, never was taught to scrub a floor, or make a jacket or a dress, and who if the table or chair was falling to pieces could not drive a nail straight to keep it together. She has no idea of the importance of ventilation, and was never taught to hold her head up or to expand her chest. She is depressed and discouraged by the consciousness of her own inability to deal with the increasing desolation by which she is surrounded, and flies for refuge to the seductive tea-pot, which is constantly simmering by the smoky, dust-choked fire, and from which she derives no doubt a stimulant, but also a sure, though slow, poison. Some one will reply that we have nothing to do with the mother, that we cannot alter her now,

and that I am wandering from the point. I think we could do a great deal for her, and that the machinery is at our hands to do it if we would only open our eyes to see it.

I have, however, only introduced the mother to show that there is nothing to be expected from her, and that if we are to do anything for the child it must be while he is in our own hands.

This poor child's breakfast will consist of a little white bread and butter and tea. Now, the growing tissues of the child require a very large supply of nitrogen and phosphates.

The white bread contains, probably, less than 2 per cent. of nitrogen and practically no phosphates, and the tea contains xanthine, which is rapidly converted into uric acid. Yet with no further provision the child has to start for school, where he will begin his work at 9 30 or 10. He is then in the schoolrooms for 2½ to 3 hours with a large number of other children (who, probably, like himself, are almost wholly innocent of soap and water), many of whom are centres of infection, either directly or indirectly. The air grows heavy and fœtid, and the child becomes listless and inattentive, and standing or sitting twists his body into whatever position will give his weary little muscles the most ease for the time being, and thus begins to establish incipient spinal curvature and other deformities. At 12 or 12 30 he will be allowed out to the playground for about half an hour, when he may eat any lunch he has brought with him and get some air and exercise.

He will then return to the schoolrooms for another 2 or 2½ hours to listen to, or take part in the dreary recitation of lessons, most of which are wholly of an abstract nature, and are not and cannot be made the least interesting, and which will at the best only force the child through an examination without doing anything whatsoever to equip him for the battle of life.

Many of these children spend from 4½ to 5 hours every day

in these unhealthy and crowded schoolrooms, and many of the teachers are there 6 hours or more. Is it to be wondered at if during the last few hours both teachers and children are irritable and longing to escape, and that the children not unfrequently look upon the teachers as their natural enemies, and seize every opportunity of resisting their authority, and finally that both teachers and children get home too jaded to eat their dinner, or if they do eat it they certainly have not the nerve energy to digest it?

Now, every step in this daily history is not only unphysiological, but it is directly contrary to all physiology. We blame the Egyptians for expecting the children of Israel to make bricks without straw, and yet we expect children to build brains without either food or pure air. We burden and break down both teachers and children by making excessive demands upon their memories and their endurance, and we do not supply them with the means of strengthening either.

At certain periods, what are called examinations are held. Are they examinations? Are the children's eyes tested? Are their teeth looked at? In some parts of America this is done every year. Is there any systematic effort to see that their weight is proportionate to their years and height? Are the examiners capable of examining children? Are their minds really occupied with the children and the teachers, or are they crowded out by long lists of questions and answers, marks and percentages, and the complicated regulations and instructions of their Boards and Committees, who know nothing about the individuals to be dealt with? How many examiners could tell you whether a child's eyes were dull and leaden or unduly bright and nervous, or his hair well-grown or feeble and disposed to fall out, or his teeth well formed or decaying, or his ears and jaw properly developed, and his head symmetrical? The examiner has not been taught to observe

such things or to draw any conclusion from them if he did observe them. He will tell you he has no time, his Board will be down upon him if he does not make his district show as good a percentage as other districts, and if the child breaks down as soon as it leaves school he cannot be held responsible, and he has no time for anything else. Nobody has any time; everybody is overworked, and feels that much of the work is worse than useless.

The demon of what are called examinations—that is, question and answer, percentages and result fees—dominates every place and every hour. The child is nothing, the examination is everything.

Is it any wonder that all the civilised nations of the earth are laughing at us? Just look at our coinage; our weights and measures to begin with. How many children are annually driven mad or epileptic by our compound addition, compound multiplication, compound subtraction, compound division, and all the other compounds and complications that must arise from our 4 farthings in a penny, 12 pence in a shilling, 20 shillings in £1; or 12 inches 1 foot, &c.

How many years of worse than useless toil have been spent over all this which has been long ago wiped out in other countries by the decimal system?

The educational value of an idea is its capacity for association and suggestion, and hence in the metric system each unit as it occupies a definite relationship to the whole of the rest of the system is of considerable value in this respect, while in our conglomeration of incoherent delirium each isolated fact stands out on independent principles and bears no relationship to anything else in the universe, unless indeed it be one of an adverse and injurious nature to the unfortunate child who fails to retain it in his overstrained and exhausted memory. I am aware that the British Association some years ago passed a resolution against the decimal system, but I am also aware that the British Association believed in De Rougemont.

Can it be wondered at that we frequently find ourselves sitting upon an Austrian chair, eating bread made of Californian flour, butter from Denmark, cheese from Holland; that the lamp chimney is from Saxony, that we write upon German paper, that we cut the grass with an American lawn-mower, that the tram rails in our streets are made in Belgium? While other countries are manufacturing everything for our daily use, we are, by our present school system, manufacturing anæmia, tuberculosis, epilepsy, and insanity.

If, however, we assume that we have a sufficient stream of healthy blood, and that we are provided with all the physical accessories of digestion, respiration, &c., necessary for its maintenance, the next physical consideration which must occupy our attention will be the development of the special organ by which our moral and mental faculties are capable of placing themselves in communion with our material surroundings. In other words we must now consider for a few moments the development of the centres of the brain.

There is sufficient evidence to show that certain parts of the brain are specially endowed with certain special functions, and also that sufficiently defined localities in the brain preside over or are roused into activity by certain definite movements of the muscular system.

The brain may, therefore, be compared to a workshop in which a number of different processes are carried on in different departments, the whole tending towards the completeness of the finished article, in the manner suggested by our examination of the apple. And we see that when injury or disease affects certain portions of the brain the corrective power which that particular portion of the brain would possess becomes lost to the individual, and if it be one of the portions essential to mental operations, his conclusions will be ill-balanced and incorrect.

Havelock Ellis, who is one of the greatest authorities on

criminology, has arrived at the conclusion that the two conditions most frequently associated with criminality are an unsymmetrical brain and loss of self-control, and it is probable that these conditions are more or less associated and dependent upon one another, for even in those cases where lack of symmetry is not discernible externally, yet there may be unsymmetrical development from internal disturbance of nutrition or association.

It is therefore evident that if we would aim at having a healthy mind we must begin by having a healthy body, and that upon this as foundation we may reasonably hope that we ought to be able under suitable circumstances to build up such a healthy condition of brain development as may lay the physical basis for a strong and sound mind. For it should be remembered that physical observations must of necessity precede and lay the foundation for mental observations, and that upon the soundness of the physical observations much of the correctness of subsequent mental deductions will depend.

In a similar way if the mental estimates of right and wrong become correctly established the moral influence on the individual may reasonably be expected to be more or less correct and permanent, and hence that if we have satisfactorily accomplished our aims physically or mentally we have at all events done much to start the individual on the road towards moral rectitude, and so have as nearly as possible brought about that happy condition which we might consider to be described by the expression an educated or developed man.

Huxley's definition of an educated man: "That man, I think, has had a liberal education who has been so trained in youth that his body is the ready servant of his will, and does with ease and pleasure all the work that as a mechanism it is capable of; whose intellect is a clear, cold, logic engine, with all its parts of equal strength and in smooth working order;

ready, like a steam engine, to be turned to any kind of work, and spin the gossamers as well as forge the anchors of the mind; whose mind is stored with a knowledge of the great and fundamental truths of nature and of the laws of her operations; one who is no stunted ascetic, is full of life and fire, but whose passions are trained to come to heel by a vigorous will, the servant of a tender conscience; who has learned to love all beauty, whether of Nature or of Art, to hate all vileness, and to respect others as himself."

If, then, the foregoing considerations have assisted us in arriving at an understanding of what we mean by the word education, we must direct a few moments' attention to the qualifications of those who have assumed the responsibilities in these countries, and we may briefly divide them into three groups:—

1st. University dons with caps, gowns, and spectacles, a considerable knowledge of the classics, and, perhaps, of some abstract mathematics.

2nd. Ecclesiastics who are probably classical and literary, and whose necessarily isolated position can scarcely fail to result in narrow-mindedness, and although excellently intentioned from a moral point of view, absolutely oblivious to the physical laws which underlie all practical morality.

3rd. The schoolmaster, who as he at present exists does not seem to grasp the true view either of education or of the creature to be educated; he has not really been taught to teach, he does not regard it as essential that knowledge to bear fruit in wisdom must first become part and parcel of the individual who possesses it; and, second, that that individual must be able to make himself the medium of so associating his knowledge with the circumstances with which he is contending as to bring harmony out of discord and to establish effective relationship where hitherto antagonisms alone has existed.

These people are called "educationalists!" Shakespeare has well said: "What is in a name?" and surely there is nothing in this name, for every one of these groups are as a body absolutely ignorant of even the rudiments of physiology or biology, and it is an everyday experience to see boys hurried from a stodgy dinner into the football field, or to find a child who suffers from astigmatic headache bullied for being stupid or inattentive, and condemned to write several hundred lines of some classical trash, with the inevitable consequence that the astigmatism is increased, the brain exhausted, and an unutterable detestation of all literary work permanently fixed in the child's mind.

It is surely, therefore, sufficiently manifest that the only training by which we many hope to bring about a healthy control of the educational question in the true sense is that of our own profession, and the rapid strides made in Sweden, Denmark, and Germany in latter years has been almost entirely brought about by the medical profession taking so decided an attitude that it has been recognised by the Governments of these countries; and if we would rescue our people from their present painfully backward position it can only be done by our following at home this noble example set by our professional brethren abroad.

ON A CASE OF POISONING BY CANTHARIDES.

By F. C. MARTLEY, M.A., M.D., D.P.H.

[Read in the Section of State Medicine, April 22, 1904.]

THE rarity of death from the administration of cantharides has induced me to bring this case before the Academy; the details of it were kindly furnished to me by Professor Lapper.

The tragedy took place last winter in the West of Ireland, and the victim was a woman, aged fifty-two. About 9 p.m. on a Wednesday evening in December last she was induced to drink some rum containing cantharides powder. The quantity of the powder cannot be discovered with accuracy, but the man who administered it purchased an ounce, and very probably gave the entire amount. The draught was given in the dark, and so the victim was not able to notice the appearance of the mixture.

The after history of the case may be summed up in the words "constant vomiting," which came on immediately, but it was only at 4 30 a.m. on Friday morning, or after a period of 31½ hours, that death ensued from exhaustion.

At the *post-mortem* examination none of the powder could be detected in the stomach, which, however, was intensely inflamed and contained a fatty matter like butter. The first 18 inches of the small intestine contained only a few particles, and was also intensely inflamed.

Traces were also evident on portions of the dress, in some dried up bloody evacuations from the bowel, and on portions of the blanket.

The vomit had been thrown out on to the grass, and a careful examination of a sod from the place revealed great abundance of unmistakable fragments of the wing cases of the fly.

It was thought that the motive for the administration was due to the supposed aphrodisiac properties of the drug.

GAS-POISONING IN DUBLIN.

By E. J. McWEENEY, M.A., M.D., D.P.H.;
Professor of Pathology and Bacteriology at the C. U. Medical School;
Pathologist to the Mater Misericordiæ Hospital, Dublin.

[Read in the Section of State Medicine, April 22, 1904.]

DURING the past three years no less than ten cases of coal-gas-poisoning have occurred in Dublin. Seven of these were fatal. During the previous twenty years no case of the kind is recorded as having occurred. As the mode of using coal-gas can hardly be regarded as having changed, the sudden commencement of fatalities from inhaling it can be ascribed only to some change in the gas itself. I propose, in the first place, to detail the cases, with all save three of which I was personally concerned. They are divisible into four groups:—

GROUP I., COMPRISING FOUR CASES (ONE FATAL).

This occurrence took place in Nov., 1901, at a small house in Eccles-place *to which gas was not laid on*. There were only two rooms in the house, one over the other. In the lower room—the kitchen—dwelt a man and his wife, whilst her father and his son slept in the upper room. This room had no fire-place. The old man (aged sixty-seven) was a coal labourer; the son-in-law was employed on the railway. On the 15th Nov. all four persons were feeling unwell, and the son-in-law sent for a doctor, who, on arrival, perceived a strong smell, suggestive of mixed coal and sewer-gas, pervading the house. He cautioned the inmates on no account to sleep in the house that night. To this warning they paid no heed and slept there as usual, retiring at 10 p.m. Next morning, between 6 and 7 a.m., the son-in-law felt so unwell that he left his bed and went to the Mater Hospital. He complained of headache, vomiting and prostration; pulse 120. There was some suspicion of ptomaïn-poisoning, as he had

partaken of tinned fish the previous day. After a time he felt better and returned home. Nothing more was heard of the family till noon on the following day (Nov. 17), when another married daughter of the old man knocked at the hall-door, and after some time was admitted by the son-in-law. He staggered after opening the door, and seemed giddy and stupefied. His wife was in a similar plight. The police were sent for, and on going up stairs they found the old man lying dead and naked on the floor. The son was sitting in a dazed condition at the top of the stairs.

Autopsy.—This I performed next day at the Mater Hospital whither the body was conveyed. Body that of a well-nourished elderly man. Hands black (from handling coal). Face pale. The lips, ear-tips, and *post-mortem* stains over the trunk were bright pinkish-red. Pupils normal. Rigor mortis well marked. Profound anthracosis of lungs, with a small encapsulated abscess in the right base; obsolete tubercle of both. Heart dilated and fatty. Slight increase of pericardial fluid; a little liquid in both pleuræ. Other organs normal. The blood was mostly uncoagulated, and decidedly brighter in colour than normal. Dropped into water it gave a cherry-red solution instead of the usual yellowish tinge. It gave the tannin and alkali tests for carboxy-hæmoglobin. Examined with the spectroscope, after treatment with ammonium sulphide and warming, it gave the two persistent absorption bands characteristic of carboxy-hæmoglobin. Titrated by Haldane's colorimetric method, the percentage saturation with carbon monoxide was found to be 73 per cent.

Condition of Survivors.—The son (who slept in the same room as deceased) was found on admission to be pale, semi-collapsed, almost unable to walk. He felt cold (temp. normal), pulse 120. He did not complain of headache. The blood count yielded reds 4,800,000, whites 10,000, about 60 per cent. being polynuclear and the remainder lymphocytes. A specimen was tested for CO-Hgl. on the day after the occurrence with negative result. Nothing abnormal was noted in the urine.

The son-in-law's symptoms were in two respects the reverse of those just given. He had severe headache and slow pulse (about 48) on admission. He was almost unable to walk. He ahd 6,000,000 reds and 8,700 whites, with 30 per cent. of mononuclear in his blood next day. CO-Hgl. not demonstrable.

The daughter recovered speedily, and refused admission to hospital.

Inspection of Premises.—Gas not laid on; no fittings in house. Lower room 19 feet 4 inches long by 16 feet wide, and 9 feet high. Fire-place and small window. Upper room 18 feet by 15, with a sloping roof rising from 5 to 7½ feet above floor. Three windows nearly on floor level, each measuring 3 feet 2 inches by 2 feet 10 inches. There was no fire-place. There was a skylight 2 feet 1 inch by 1 foot 5 inches over the head of the stair, and far away from the bed. At the time of the occurrence all the windows were closed, but there was some doubt as to whether the skylight may not have been partly open. At the time of my visit some days afterwards it was fully open.

Explanation of the occurrence.—The premises on being entered smelt strongly of coal-gas. The occupiers of the adjoining house (detached)—a man, wife, and 6 children—complained of a similar smell, but suffered no ill-effects. The Gas Company's officials found the main gas-pipe broken about 18 inches below the macadamised surface of the street, just opposite the house. The fracture was of recent date, and probably caused by some heavy vehicle. The surrounding earth smelt strongly of gas, which must have found its way through the soil into the house. The sewers were examined and found staunch. It is interesting to note that, whereas the gas entered below, its effects were most severely felt in the upper room—a fact accounted for by the absence of a fire-place in the latter.

GROUP II., COMPRISING THREE CASES (ALL FATAL).

The accident befell a family consisting of a man, aged thirty-eight (mechanical engineer), his wife, aged twenty-six, and their child, aged five years, who were found dead in their cottage on the evening of the 7th of April, 1902. I was absent on the Continent at the time, and owe my knowledge of it to the courtesy of the City Coroner (Dr. L. A. Byrne).

At the inquest it appeared that the family were about as usual on the previous day. Several persons having called at the house during the morning and early afternoon of the 7th, and having failed to elicit any response from the inmates, the door was forced at 8 p.m. by the police, who were at once driven back by the

overpowering odour of coal-gas. On effecting an entrance 15 minutes later, the man was found lying dead on the floor of the front room, attired only in a shirt, as though he had risen from bed and attempted to reach the door. The bed contained the bodies of his wife and child. All had been dead some hours.

Inspection of Premises.—The "penny-in-the-slot" meter which stood on a shelf in the living room had been disconnected and removed, and by means of two pieces of brass pipe and some flexible rubber tubing a direct connection had been set up between the gas main and the house supply. The pieces of brass pipe used for this purpose were of smaller bore than the gas-mains into which they were inserted, the joints being made staunch with red lead. Over the free ends of the brass pipes thus fixed the rubber tubing had been slipped, and the gas thus "short-circuited" into the house. Unfortunately for the inmates, the rubber tube had in some way become disconnected during the night, with the result that all three were asphyxiated.

Autopsy.—This was carried out next day in all three cases by Dr. H. C. Earl at the Coroner's request. The medical evidence describes the peculiar bright pink colour of the *post-mortem* staining, the bright cherry-red colour of the uncoagulated blood, and its characteristic behaviour to the usual chemical and spectroscopic tests. The cause of death was poisoning by carbon monoxide gas. This man was a mechanical engineer, and it is only too evident that his life and those of his wife and child were sacrificed in a clumsy attempt to defraud the Gas Company.

GROUP III., COMPRISING TWO CASES (BOTH FATAL).

The parties were a married couple, J. and G. M., who were suffocated in their bedroom at a Dublin Hotel on Jan. 15, 1903. They had arrived from the country on the previous evening and engaged the room, to which they subsequently retired. Next day nothing was seen of them, though it would appear that sounds of stertorous breathing were heard during the day in the narrow corridor into which the room opened. Towards evening the hotel people became alarmed and directed the porter to effect an entrance, which he did, through the window. Dr. Martin Dempsey was sent for. He pronounced the woman dead, and ordered that the man, who was lying unconscious beside her in bed, should be removed to hospital. He was admitted

nder the care of Dr. Thompson to Jervis-street, but never ecovered consciousness, and died on the third day.

Autopsy on the female, G. M., aged fifty.—This was done by myself, with the assistance of Drs. Mason and Ryan, House Surgeons, next day. Body very obese; *rigor mortis* distinct; pupils normal; ulcer on left cornea; face, lips, and conjunctivæ slightly pink, with a tinge of blue; cherry-coloured spots on trunk; heart enlarged, much infiltrated with fat, the right side distended with blood, which was slightly, but undoubtedly, pinker than normal. Lungs deeply congested, especially at base; on section, decidedly cherry-red; pleuræ free from adhesions or petechiæ. No fluid in either, nor in pericardium. The stomach contained the remains of a full meal, and its cardiac end was partly self-digested. No odour of alcohol. Duodenum very dark in hue externally, its mucosa intensely injected, and presenting minute hæmorrhages, contents bile-stained, abundant, normal. Other abdominal organs normal. No fluid in peritoneum. The mucous membrane of the larynx and trachea was very bright pink, and coated with froth. Œsophagus full of gastric contents; brain normal. The blood was between 60 and 70 per cent. saturated with carbon monoxide.

The man, J. M., aged thirty-two, lived three days in Jervis-street Hospital. Despite inhalations of oxygen, he remained absolutely unconscious without corneal reflex, breathing stertorously; urine suppressed. The blood next day looked black and tarry. It contained 7,640,000 reds and 10,000 whites. The differential leucocyte count worked out approximately normal. The temperature, which was 101° on admission, rose to 102° next day, and on the third day reached 108°, when the patient died. The hyperpyrexia may, perhaps, be ascribed to injury of the heat regulating centre by de-oxygenated blood, but I have no anatomical proof of the accuracy of this surmise.

Autopsy.—A complete and careful inspection of the organs yielded nothing decidedly abnormal. The blood was partly coagulated, and did not yield a pink solution, nor did it give spectroscopic evidence of carboxy-hæmoglobin. The treatment with inhalations of oxygen had doubtless effected complete removal of the CO, but not until after irreparable damage had been done. I made a careful histological examination of the heart, liver, and kidneys, but failed to detect more than cloudy swelling, and

(in the case of the kidneys) extreme congestion of the intertubular vessels. The brain has not yet been microscopically examined. From the other evidence, the results of the necropsy on the female, and the absence of any other cause, I considered that death was due to the results of inhaling carbon-monoxide gas, and the jury found accordingly.

Explanation of the occurrence:—When the room was entered it was in darkness, and smelt strongly of gas, which was escaping from a wall-bracket, the stop-cock of which was found to be half open. How this had come about was not fully cleared up at the inquest. Possibly the luckless couple, who had dwelt in the country, may not have been accustomed to gas, and had blown out the flame. There is another possibility. The corridor, on to which the room opened, was dark, and lighted by gas throughout the day. The supply to it and the adjoining rooms was governed by a special stop-cock, which would appear from the evidence to have been, at any rate occasionally, turned off at night, and turned on next morning. If this had occurred on the night in question, and had the couple left the gas lighted on retiring to rest, the occurrence would be most probably accounted for.

Inspection of premises.—The dimensions of the bedroom were 11 feet 1 inch long, by 10 feet 6 inches wide, and 9 feet 6 inches high, giving a cubic space of 1,105 feet, from which had to be deducted the space occupied by a wardrobe 6 feet 7 high, 44 inches wide, and 19 inches deep, and a large double bed, 6 feet 5 inches long, 44½ inches wide and 14 inches thick. There were also a large dressing-table, a wash-stand, a good-sized basket-chair, and two ordinary ones—in fact the little room may be said to have been crowded up with furniture. The cubic space thus occupied I calculated at 71 cubic feet, thus leaving only 1,034 cubic feet available for respiration. *There was no fire-place.* On the side opposite the door was a large window, which was closed, but not fastened, at the time of the occurrence. The only ventilation besides this was into a dark and close-smelling corridor, and was effected through two sets of apertures, one being a series of slits in a pane of muffed glass over the door. These were 18 in number, and arranged in 3 horizontal rows of 6 each. Each slit was 1¾ in. long, by about ⅛ inch wide, and their conjoint area I estimated at rather less than 6 square inches. Close to the floor, under the

head of the bed, was a perforated zinc plate pierced with holes, the conjoint area of which, on a liberal estimate, I reckoned at 20 square inches, and their value must have been seriously diminished by their position close to the floor. They opened into the corridor. Assuming the admitted air to be cooler than that already in the room, its only effect would be to form on the floor a purer stratum, which could but slowly affect the composition of the general atmosphere of the room. The gas-bracket was an ordinary one, provided with a No. 5 braised fish-tail burner, consuming about 5 feet of gas per hour.

The fatal result was in this case due to several circumstances, of which the leading one was undoubtedly the escape of gas, whilst the defective ventilation of the apartment in which the luckless couple were suffered to remain shut up without food or attendance during an entire day was a contributory factor. On comparing the ventilation with recognised standards, we find the entire space to have been 517 feet per head instead of 1,000. The functional fresh air inlet was only 8 square inches, but allowing the same value for the perforated zinc plate under the bed we have 16 square inches instead of 48. Of course, air can enter through any crevice. Dr. Haldane has shown that the air of such a room is changed, even in the absence of a fire-place, about once every 2¼ hours. It would, therefore, be quite a mistake to suppose that the ventilation of a room, with, at any rate, one of its walls an outer one (that is, forming part of the outside of the house), is solely dependent on the ventilation apertures made *ad hoc*. Pettenkofer experimented many years ago with a room of about 3,000 cubic feet capacity, and found that without definite ventilation, the air was changed once every three or four hours. Dr. Haldane, in his appendix to the Gas Commission Report, concludes that the air of a closed room of 1,000 cubic feet capacity is changed once in from 2 to 3 hours.

It may be interesting to inquire what was the condition of the air of this particular bedroom, assuming that the air was completely changed once every 2¼ hours by perflation through the walls, and (for the sake of ease in calculation) that its cubic content was 1,000 (instead of 1,034 cubic feet). We shall also assume that the gas continued

burning for 2 hours after the couple retired to the room (that is, till 12 o'clock) and then became extinguished. The problem may, therefore, be stated thus: —

A room has a capacity of 1,000 cubic feet, and the atmosphere is changed once every 2.25 hours. Its original composition may be assumed normal (790 vols. of N., 209.6 of O., and 0.4 of CO_2). CO_2 is introduced (*a*) by combustion of coal-gas, (*b*) by respiration. (*a*) Only goes on for two hours (at the rate of 5 feet per hour), and delivers 2.5 cubic feet of CO_2 per hour (being at the rate of half a foot of CO_2 per foot of gas burnt; (*b*) continues all through the experiment, which lasts from 10 p.m. till 6 p.m. next day (20 hours), and delivers 1.2 cubic foot CO_2 per hour (0.7 per individual).

Coal-gas is delivered into the room during the last 18 hours of the experiment at the rate of 5 feet per hour. It contains 16 per cent. of carbon monoxide.

Required—(1) The maximal percentage of CO_2 that will be reached in the atmosphere;

(2) How long it will be before it will be reached;

(3) The maximal percentage of CO which will be reached during the experimental period;

(4) How long it will be before the maximal percentage is reached—

assuming that the entering air is normal in composition, and that it at once and completely mingles with the air already in the room.

I have submitted this problem to a competent mathematical authority, who reports as follows:—The CO_2 introduced attains its maximum at the end of the first two hours, when it is 4.9 cubic feet. It then decreases during the 18 hours to practically 2.7 cubic feet. The change is more rapid at the beginning and very gradual towards the end. It is 3.51 cubic feet at the end of 2.25 hours, and 3

cubic feet at the end of 4.5 hours, so from this it changes very little.

As regards the coal-gas, the percentage goes on increasing all the time, tending towards the theoretical maximum, which would be 11.25 cubic feet, containing 1.8 cubic feet of CO. That 11.25 cubic feet is the maximum is shown by the fact that the wastage per hour would be $\frac{11.25}{2.25}$ or 5 cubic feet, which is balanced by what is delivered per hour. The maximum is never actually reached, but at the end of 18 hours the quantity of coal-gas present is 11.246, containing 1.799 of CO, which is for all practical purposes the same. The curves show the percentage of CO and CO_2 present at the stated intervals.

The outcome of this little investigation is interesting, in so far as it shows that insensibility may occur with a proportion of CO decidedly below 2 per thousand—that fixed by Dr. Haldane as the limit of danger. The persons may be assumed to have been insensible at 9 a.m., when the quantity of CO in the room was 1.767. Furthermore, they died as the result of breathing for several hours air in which, theoretically at any rate, the proportion of CO never actually attained 1.8 parts per thousand. The explanation, of course, is easy. The CO was not equally distributed throughout the room. Dr. Haldane has shown that when gas is allowed to escape into a room the atmosphere becomes most unequally charged with it, more than twice as much being contained in some parts than in others. We may assume that this was the case here, and the practical outcome is that escapes of gas which are theoretically insufficient to render the air of a room poisonous may as a matter of fact be attended with fatal consequences.

GROUP IV.—COMPRISING CASE X. (FATAL).

The last case is of interest as illustrating the danger of

badly constructed arrangements for the rapid heating of bath-water—what are known as geysers.

On the night of March 30th, 1904, at about 9 o'clock, J. J. K., aged twenty-nine, pharmaceutical chemist, went to take a bath at his residence (Grand Canal-street Dispensary). About three quarters of an hour afterwards, the servant, whom he had sent out on an errand, returned, went up stairs, and on coming down again noticed a strong smell of gas on the lobby. Through the muffed glass door she saw the light in the bath-room, knocked, and getting no reply sent for the caretaker, who burst open the door, when the body of the unfortunate young man was found lying just inside, between door and bath. The body was nude and wet. So overpowering was the atmosphere that the caretaker was almost overcome in the act of dragging the body out on to the lobby, when he applied artificial respiration, telephoning meanwhile for Dr. Herbert Byrne, who, on arrival, pronounced life extinct.

Autopsy.—This was performed next day by myself, and revealed no trace of disease in the body, which was that of a finely-developed young man. *Rigor mortis* extreme. Face and lips pale; *post-mortem* staining of ear-tips and trunk, pink. Blood quite fluid, bright cherry-red. I was unable to detect much difference between a dilute solution of this blood and a similar one of normal blood (my own) shaken up with coal-gas to complete saturation. An accurate titration revealed the fact that the sample taken from the right auricle was 87 per cent. saturated, and that from the left auricle 87.7 per cent. saturated with carbon monoxide. I learn from Professor Lorrain Smith, who kindly did the titrations for me, that this is the highest percentage saturation as yet seen in the human subject. There remained only one-eighth of the subject's hæmoglobin available for oxygen carriage. The lungs were œdematous, and both they and the blood smelt strongly of coal-gas.

Inspection of the Premises.—A bath-room 7 feet by 7, with a sloping roof varying from 6 to 7½ feet high. Most of the available floor space was taken up by a full sized metal bath and a pedestal w.c., which stood beside the head end. At the other end was a chair. There was just enough space to stand comfortably between the door and the side of the bath.

The upper half of the wide double doors was glazed with muffed glass. They fitted tightly. On the other side of the bath was a large "French" window, which was closed at the time of the occurrence. On the same side was an ordinary Sheringham valve. It was described as slightly open at the time of the occurrence. The geyser was placed over the foot end of the bath. It consisted of a metal heater of about two gallons capacity, into which water was led through a pipe connected with the supply to the bath. From the heater a brass tube ran out over the bath. Underneath, in a space partly surrounded by a japanned metal jacket, but open in front, stood a battery of six powerful Bunsen burners, which were supplied by a half-inch gas pipe, from which the supply to the wall-bracket was also derived. The heated air and products of combustion were carried up round the side of the boiler within an outer metal casing, which was contracted over the top of the boiler into a sort of funnel discharging them into the room. *There was no ventilation pipe.* A metal disc guarded the ceiling from being blackened by the products of combustion arising from the funnel, but there was no arrangement for safeguarding the life of the luckless person who might shut himself up in this nearly air-tight space of 343 cubic feet with six Bunsens capable of burning about 60 feet of gas, and therefore of consuming about 300 feet of air in a single hour!

There are various ways of accounting for the poisonous condition of the air in the bath-room:—

(1) One or more of the burners may have remained unlighted. All were on the same tap.

(2) They may have "struck back."

(3) By impinging on the cold metallic surface, the flames may have had their temperature so much lowered that combustion became imperfect, with liberation of CO.

(4) The oxygen of the air may have become so much consumed and so much charged with the products of combustion that the gas issuing from the burners was only partially consumed, with consequent liberation of carbon monoxide.

I will conclude by recalling the fact that whereas in 20 years there was no death from coal-gas poisoning in Dublin, there have been 10 cases, with 7 deaths, in the last three years, and by stating the cause which clearly accounts for this sudden appearance of a new danger in our midst. Since February, 1900, the Gas Company have been adding *carburetted water-gas* to their ordinary coal-gas. Water-gas is made by passing steam over red hot coke according to the equation—

$$C+H_2O=CO+H_2.$$

It is "carburetted" by charging it with the vapour of petroleum or other oils. It thus acquires illuminating power and a pungent odour, which all consumers of the Dublin gas must have remarked of late years. It is cheap, a good illuminant, and can be quickly produced in large quantity to meet emergencies. The drawback to its use is that it contains 30 per cent of carbon monoxide, and is, therefore, highly dangerous. From researches by Lorrain Smith, published in the Appendix to the Report of the Water-Gas Commission (1899), it appears that the poisonous character of coal-gas is entirely due to the carbon monoxide it contains. The proportion of carbon monoxide in ordinary coal-gas is 6 per cent. Air containing 2 vols. per thousand of carbon monoxide produces headache, giddiness, incapacity for muscular exertion, and other symptoms. When the amount rises to 4 vols. per thousand the result of breathing it is fatal. The mortality from accidentally breathing coal-gas mixed with air has been shown by Haldane to increase not merely directly with the percentage of CO in the air, nor even as the square of the increase, but actually as its *cube*. Thus, if the percentage of CO in coal-gas is doubled, the mortality becomes eight times what it previously was: if the CO is

trebled the mortality becomes 27 times as great. This somewhat alarming fact has been deduced by Haldane (*loc. cit.*) from the statistics of the great American cities, many of which, such as Boston and Chicago, have been using almost pure water-gas since the introduction of its manufacture some 12 or 14 years ago. The Dublin gas, which, up to February, 1900, contained no more than the normal 6 per cent. of CO had its proportion of that substance raised during the month mentioned to about 16 per cent., and as recent analyses, kindly carried out for me by Mr. Holmes Pollok, B.Sc., of the Royal College of Science, have shown, it still remains at that figure. The practical inferences would appear to be: —

(1) That notice ought to be given by gas producers of their intention to increase the percentage of carbon monoxide, and that they ought to keep a record and furnish it at regular intervals to the sanitary authority stating the percentage present each day.

(2) That the legislature ought to impose some restriction on the percentage of water-gas supplied with coal-gas to consumers, so as to keep the CO within reasonable bounds.

(3) That the sanitary authority ought to have power to inspect gas-fittings, especially those of gas-cookers, geysers, and the like, and also to prohibit the laying-on of gas to bedrooms under 1,000 feet capacity and without a chimney. Faulty fittings and unventilated geysers might be treated as nuisances under section 107 of the Public Health Act.

(4) That the laying of gas-mains should be very carefully done in towns where carburetted water-gas is used, so as to avoid danger from accidental breakage of the pipes.

In writing the above I have no desire to excite alarm. I

have thought it well to lay before the profession the special experience I have had of this form of fatality, and I desire at the same time to draw their attention to the fact that obscure and otherwise inexplicable cases of ill-defined character may sometimes be accounted for by the existence of a slight leakage of coal-gas as at present supplied.

SECTION OF ANATOMY AND PHYSIOLOGY.

THE ANATOMY OF THE VISCERAL PELVIC FASCIA.

By R. ATKINSON STONEY, M.B. Dubl.;
Visiting Surgeon to the Royal City of Dublin Hospital;
Chief Demonstrator of Anatomy and Joint Lecturer in Applied Anatomy, Trinity College, Dublin.

[Read in the Section of Anatomy and Physiology, January 29, 1904.]

By the introduction of formalin as a hardening reagent in the study of anatomy, not only have many new facts been discovered, but others which were already known have become more easy to demonstrate. I shall commence by giving a short account of a method of demonstrating the visceral pelvic fascia in bodies which have been hardened in formalin. After hardening by injection or immersion, the pelvis is cut mesially, and it is then found possible to remove the viscera out of the capsules formed for them by the pelvic fascia, and so obtain an uninterrupted view of the formation and connections of these ensheathments.

The method adopted is as follows:—In the case of the prostate, the handle of the knife is introduced between the posterior cut edge of the prostate and its capsule; it is found that it can be pushed up to the junction of the bladder and prostate and downwards to the point where the urethra pierces the deep layer of the triangular ligament, and that it can be pushed completely round the gland, so as to emerge between the anterior surface of the prostate and its capsule. On cutting across the apex of the prostate, where it is pierced by the urethra, the prostate can be lifted out of its capsule; the only place where there is any difficulty in freeing the gland

from its capsule is close to the middle line in front, and at the apex where it is pierced by the urethra.

In the case of the bladder also the capsule may be dissected off; but as it is very much thinner than that which surrounds the prostate, and more adherent, the cutting edge of the knife has to be freely used. Behind the bladder is a thick-walled capsule, from which the seminal vesicle and vas deferens may be removed; this, as we shall see, is formed by a splitting of the fascia forming the posterior portion of the capsule of the bladder.

Dissections made in this way illustrate the visceral pelvic fascia in a very striking manner, and bring out some points which I believe to be new.

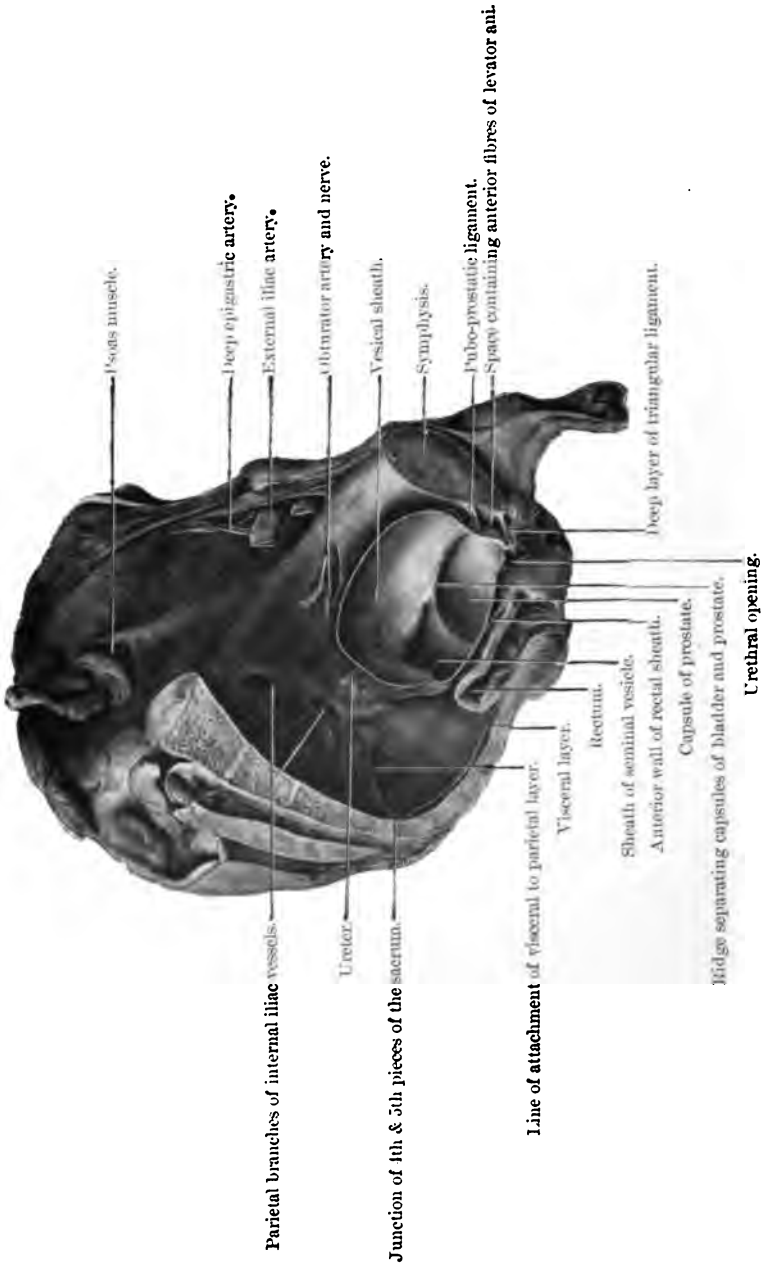
Speaking in general terms, one might say that the visceral layer of the pelvic fascia, instead of dividing into three layers, as usually described, gives off three sheaths—two in a downward direction to surround the prostate and rectum, and one in an upward direction to surround the bladder; and that each of these sheaths is separate and complete in itself, and in no place does one layer of fascia take part in the formation of more than one sheath. (Plate I.)

The dissection represented in Plate I. was made last autumn in a series of eight male pelves hardened in formalin. In this particular case the prostate was slightly enlarged, and the separation of the prostate from its capsule was, if anything, slightly easier than in the case of the others.

The following is a description of the visceral pelvic fascia, as demonstrated by these dissections:—

The visceral pelvic fascia is a layer of fascia which passes in a somewhat transverse horizontal plane across the pelvis, separating the pelvic cavity above from the perineum below. It has a circular attachment to the parietal pelvic fascia; only over a small extent in front does this attachment fail, and here the visceral layer gets a direct attachment to the

Plate I.



Mesial section of pelvis. Peritoneum and extra-peritoneal fatty tissue have been removed. The bladder, prostate, and seminal vesicle have been dissected from their fascial capsules, and the rectum has been removed just above its junction with the anal canal.

bony wall of the pelvis above the parietal layer. In front the visceral layer springs from the back of the symphysis pubis, about three-quarters of an inch above its lower border; from this the line of attachment gradually falls to the spine of the ischium, meeting the upper border of the parietal layer after a course of about half an inch on the back of the pubis. The attachments, therefore, of the parietal and visceral layers cross each other on the back of the pubis like the limbs of the letter **X**, and a small triangular interval is left on the back of the bone between the attachments of these two layers of fascia, from which the anterior fibres of the levator ani muscle take origin directly from the bone.

The line of attachment, as it stretches from the pubis to the spine of the ischium, passes obliquely across the obturator foramen; here there is a thickening of the parietal layer, so that, when viewed from the outside after the removal of the bone and obturator internus muscle, it has the appearance of a white line. From the angle formed by the attachment of the visceral to the parietal layer along this white line most of the fibres of the levator ani spring; but frequently it will be found that these fibres creep upwards for a variable distance, separating the two layers from one another and making the attachment, in places, lie at a higher level.

From the spine of the ischium the line of attachment of the visceral to the parietal layer continues to fall until it reaches in the middle line the junction of the fourth and fifth pieces of the sacrum.

Covering, therefore, the lowest piece of the sacrum and the coccyx, and separating the posterior surface of the rectum from the bone, are two layers of fascia—namely, the parietal and the visceral layer of the pelvic fascia. Close to the mesial plane the parietal layer is difficult to demonstrate, as it is intimately blended with the periosteum; but as it is traced outwards on either side over the coccygeus muscle it

is more distinct, and on the lateral wall of the pelvis becomes continuous with that portion of the pelvic fascia called the obturator fascia.

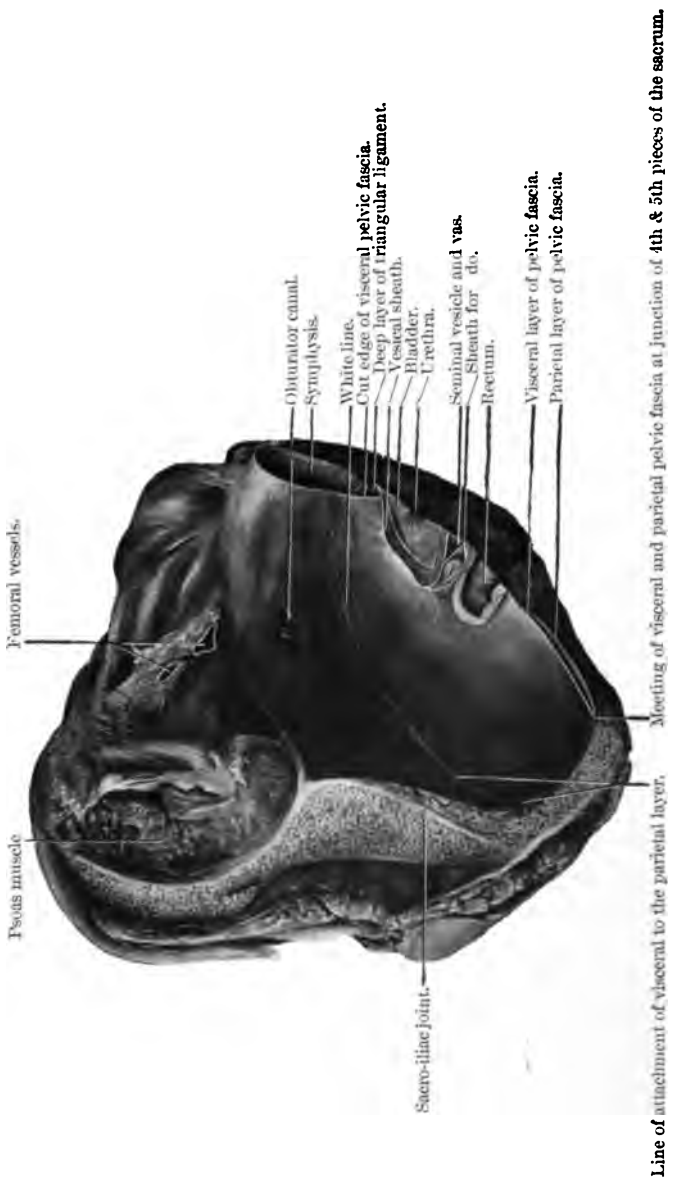
The visceral pelvic fascia, then, is to be considered as a membranous diaphragm, having a circular attachment to the parietal pelvic fascia, stretching across the pelvis between the pelvic cavity above and the perineum below, and covering the upper surface of the levatores ani muscles, which constitute the pelvic diaphragm.

Passing from the pelvic cavity into the perineum are two sets of structures—the urogenital apparatus and the alimentary canal—the former consisting of the bladder, urethra, prostate, and seminal vesicles, the latter consisting of the rectum and anal canal. These pierce the membranous diaphragm in order to reach their destination in the perineum. If it were not for this fact, the visceral pelvic fascia would form an unbroken septum, stretching completely across the pelvis from the white line on one side to the white line on the other side, and from the pubis in front to the sacrum behind, and would be as simple in construction as the layer of abdominal fascia which covers the under surface of the diaphragm. If the urogenital organs and the rectum are removed from a pelvis, we see, stretching across and forming the floor of the pelvis, this continuous layer of fascia, interrupted in the middle line by two large openings, the anterior for the passage of the urogenital apparatus, and the posterior for the passage of the alimentary canal. Between the two the fascia can be traced continuously across the pelvis from one white line to the other. Plate II., which is drawn from a dissection, shows this appearance in one half of a pelvis.

The arrangement of the visceral fascia as it comes into relation, first, with the urogenital apparatus, and secondly, with the alimentary canal, must now be considered.

The visceral pelvic fascia passes inwards towards the centre

Plate II.



Section of pelvis. The upper part of sacrum has been cut away very obliquely with part of the innominate bone; the peritoneum and extra-peritoneal fatty tissue have been removed, also the greater part of the bladder, seminal vesicle, and rectum. The line of attachment of the visceral to the parietal layer has been somewhat accentuated in the drawing.

of the pelvis, from the back of the pubis in front, and from the white line on either side, till it meets the urogenital apparatus; this it does at the junction of the bladder and prostate, and here it splits into two layers, one passing up around the bladder, the other down around the prostate. As the layer passes up over the bladder, it gradually thins on the front and sides, but may be traced all over the bladder as a distinct and complete capsule; the portion covering the back of the bladder is greatly thickened, and is split into two layers on either side of the middle line to enclose each seminal vesicle and vas deferens, but in the middle line these two layers are blended together again. The layer which passes down around the prostate forms a complete sheath, which is somewhat funnel-shaped, having its broad end uppermost at the vesico-prostatic junction. It gradually tapers towards the apex of the prostate, where it meets the deep layer of the triangular ligament, and gains a circular attachment to it around the opening in the latter for the passage of the urethra. Here, therefore, around the urethral opening, the visceral layer of the pelvic fascia represented by the capsule of the prostate is attached to the parietal layer represented by the deep layer of the triangular ligament. These two layers, into which the visceral fascia splits, may be called the vesical sheath or capsule and the prostatic sheath or capsule. Separating these two capsules is a well-marked ridge, which fits into the angle between the upper surface of the prostate and the under surface of the bladder, as is well seen in Plate I.

Besides this sheath of the visceral fascia which surrounds the prostate, and is called the capsule "of the prostate," there is a special investment of fibrous tissue for the gland, which is closely adherent to the gland, and cannot be separated from it without lacerating the gland tissue. This is analogous to the fibrous capsules of the liver and spleen, and may be called the fibrous investment of the prostate. It has of course no

connection with the pelvic fascia.* It is between these two sheaths that the prostatic plexus of veins is situated. These veins are chiefly massed in the middle line in front, and on either side in the angle of junction between the prostate and bladder; it is indeed this lateral mass of veins which is the chief factor in the formation of the ridge seen in Plate I., separating the cavities from which the bladder and prostate have been removed. The visceral pelvic fascia, as it passes back from the pubis to the urogenital apparatus, is specially thickened into two bands, one on either side of the middle line; these thickenings are called the pubo-prostatic ligaments or anterior true ligaments of the bladder. In the middle line between these two ligaments the fascia is much thinner, and dips down so as to form a small pouch which will just admit the tip of the finger, but across the bottom of which the fascia can be traced. As a rule, it will be found that the point at which the visceral layer meets the urogenital apparatus in front sinks somewhat below the vesico-prostatic junction, and is situated a little above the middle of the anterior surface of the prostate, so that the vescial layer has to pass up over the prostate for a short distance before it reaches the bladder. This attachment is lowest in the middle line and rapidly rises on either side till it reaches the vesico-prostatic junction, close to the attachment of the pubo-prostatic ligaments; in this way a somewhat V-shaped portion of the anterior surface of the prostate is covered by what is really the vesical layer of the visceral pelvic fascia. This is shown in Diagram I.

There is a space formed behind the pubis, between it and the deep layer of the triangular ligament in front, the visceral pelvic fascia above, and the anterior portion of the capsule

* These names, capsule of the prostate, and fibrous investment, ought probably to be reversed, but the name capsule of the prostate has been used so long to designate the sheath derived from the pelvic fascia that it is probably too late to try and alter the names.

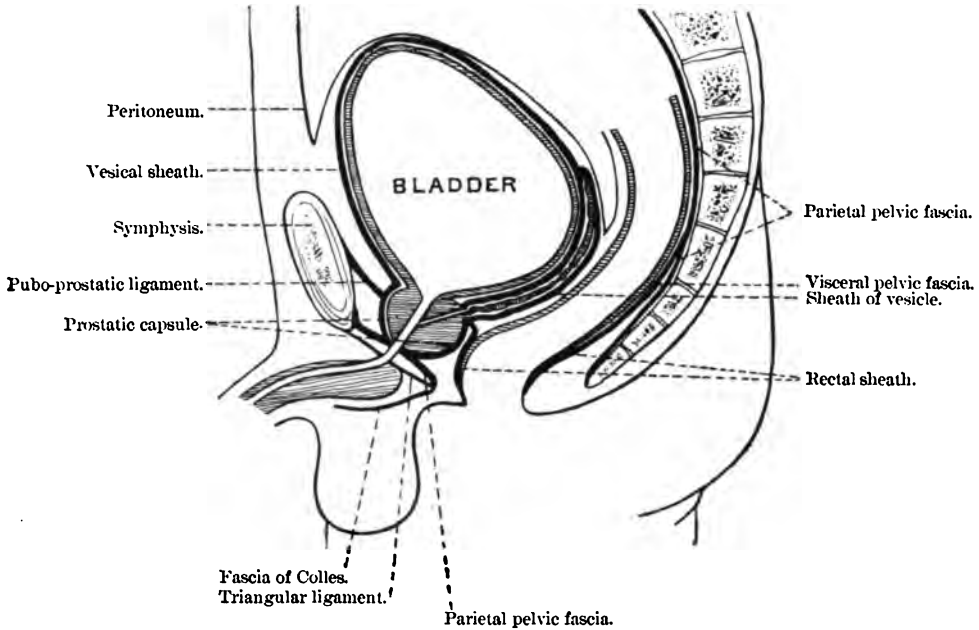

Peritoneum.
Vesical sheath.
Symphysis.
Pubo-prostatic ligament.
Prostatic capsule.
BLADDER
Parietal pelvic fascia.
Visceral pelvic fascia.
Sheath of vesicle.
Rectal sheath.
Fascia of Colles.
Triangular ligament.
Parietal pelvic fascia.

DIAGRAM I.

Diagram II.

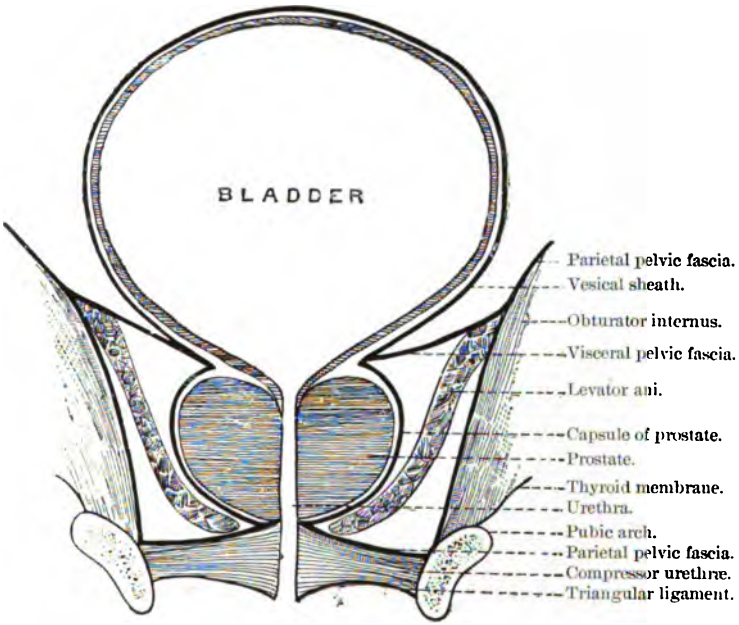
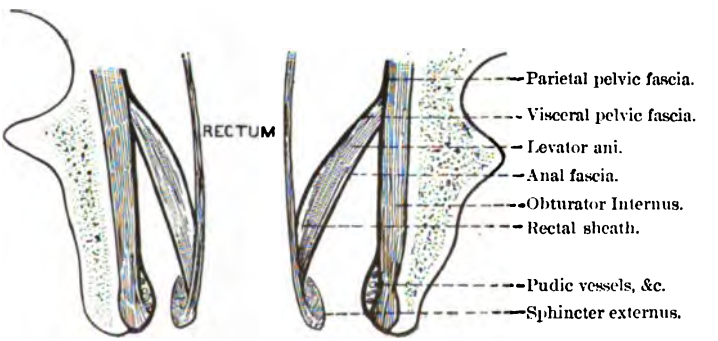


Diagram III.



of the prostate below (see Diagram I.). In the middle line this space is greatly reduced in size, owing to the pouching down of the visceral fascia between the two pubo-prostatic ligaments and the sinking down on the anterior surface of the prostate of the attachment of the visceral fascia, as described above; but on either side, under the pubo-prostatic ligaments, the space is larger and is very distinct. Lying in this space is some fat, the amount varying with the development of the adipose tissue in the body; but more important than this, on either side of the middle line are the anterior fibres of the levator ani as they spring from the posterior surface of the pubis. The muscles of either side meet in the middle line by their anterior borders, and have no fascia intervening between them, as the visceral fascia passes continuously across the middle line on their upper surfaces from one pubo-prostatic ligament to the other. As the anterior borders of the two levatores ani pass backwards, they separate so as to embrace the apex of the prostate as it is being pierced by the urethra; behind this they meet again and pass backwards in company to the rectum. At one point, therefore, and at one point only—namely, the apex of the prostate—does the visceral layer (represented by the capsule of the prostate) turn round the anterior border of the levator ani and join the parietal layer (represented by the deep layer of the triangular ligament). (See Diagram II.)

Behind the urogenital apparatus the visceral layer of the pelvic fascia passes in from the posterior portion of the white line and the line of its attachment to the parietal layer, which stretches from the termination of the white line at the spine of the ischium to the junction of the 4th and 5th pieces of the sacrum. As it does so it meets the rectum at its junction with the anal canal. It is then carried down for a short distance on the walls of the anal canal in the form of a tubular sheath; this may be called the rectal sheath of the visceral pelvic

fascia. This may be best understood by imagining that behind the urogenital apparatus the pelvis is separated from the perineum by a complete septum of the visceral pelvic fascia stretching from the vesico-prostatic junction in front to the junction of the 4th and 5th pieces of the sacrum behind, and that through this the rectum is pushed, so that the anal canal projects below it, clothed by a funnel-shaped sheath it has drawn down with it in its passage.

The visceral fascia as it passes in from the side lies on the upper surface of the levator ani muscle, and is led by it to the front and lateral walls of the rectum (Diagram III.). Behind it passes in from the parietal fascia as it covers the front of the sacrum at the junction of the 4th and 5th pieces, being separated from the inner surface of the parietal layer, as it covers the coccygei muscles, by a small quantity of areolar tissue. Owing to the close apposition of the rectum to the front of the sacrum and coccyx, this portion of the visceral fascia may be said to meet the posterior wall of the rectum as soon as it springs from the parietal layer, but it is separated from the muscular coat of the rectum by a quantity of loose perirectal tissue, in which lie numerous blood-vessels, and it does not come into close contact with the posterior rectal wall until the junction of the latter with the anal canal—that is, the same level at which the visceral fascia meets the alimentary canal in front and at either side. So although it might seem at first sight that the sheath of fascia surrounding the rectum was more extensive on the posterior aspect of the gut than on the front and sides, this appearance is merely due to the close apposition of the rectum to the curve of the sacrum and coccyx; and it may be shown that this is the true explanation by drawing the rectum forwards, for then it will be seen that the upper part of the fascia leaves the rectal wall and forms a horizontal shelf behind the rectum continuous with the fascia passing in to the sides of the rectum on the upper

surface of the levatores ani; whereas the lower portion—*i.e.*, that below the recto-anal junction—is more closely attached to the wall of the gut, and is therefore a part of the true rectal sheath.

There are two layers of fascia between the prostate and the rectum, one covering the posterior surface of the prostate and being portion of the capsule of the prostate, the other covering the front of the gut and being portion of the sheath of the rectum, These two layers meet above at the vesico-prostatic junction, where they both spring from the portion of the visceral fascia which may be said to stretch across the pelvis between the urogenital apparatus and the rectum.

Passing forwards from the front of the sacrum on either side of the rectum to the back of the bladder are the nerves and vessels going to supply the urogenital apparatus. The sacral plexus lies behind the parietal pelvic fascia, and therefore the nerves which come off from it for the supply of the pelvic viscera have to pierce this fascia in order to reach their destination; as they do so, they carry with them sheaths from this fascia; the blood-vessels, of course, lie inside the parietal fascia. There is, therefore, on either side of the rectum a distinct septum composed of blood-vessels and nerves surrounded by areolar tissue and sheaths of fascia passing from the front of the sacrum on either side of the rectum to the back of the bladder; this septum lies above the visceral pelvic fascia, and is sometimes attached to its upper surface; but as a rule, if the finger is placed on the upper surface of the visceral fascia at the side of the bladder, it can be pushed backwards on the upper surface of this fascia underneath the septum till it reaches the middle line behind, showing that this septum has either no attachment to the upper surface of the visceral fascia or only a weak one which can be easily broken down.

It is seen from the foregoing account that the arrangement

of the visceral pelvic fascia in front, as it comes into relation with the urogenital apparatus, is very much more complicated than it is behind, where it is in relation with the rectum. This is due to two causes: first, the urogenital apparatus passes not only through the septum formed by the visceral fascia, but also through the parietal layer, where it forms the deep layer of the triangular ligament, whereas the rectum has only to pass through the septum formed by the visceral layer of fascia. Secondly, in addition to the sheath given by the visceral layer in a downward direction to surround the prostate, which forms the capsule of the prostate and corresponds exactly to the sheath of the rectum, there is another sheath given off in an upward direction to surround the bladder and seminal vesicles, forming the vesical sheath or capsule.

A NEW METHOD OF MAKING BLOOD FILMS.

By HENRY M. JOHNSTON, B.A., M.B.

[Read in the Section of Anatomy and Physiology, January 29, 1904.]

I MAKE use of an instrument which consists of a glass cylinder 3.5 cm. long, and 1 cm. diameter, fixed firmly into a metal cap at each end. By this means the cylinder is connected to a metal handle (Fig. 1).

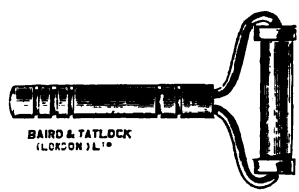


Fig. 1.

It is used as follows:—A drop of blood is withdrawn from the finger, and a clean microscopic slide (free from grease) is applied to the drop in such a way that a small portion adheres to it about half an inch from one end (A., Fig. 2). The slide, with its drop of blood uppermost, is laid on a table, the glass cylinder of the spreader is placed on the slide *in front of the drop, and drawn backwards* until it comes in contact with it. The blood in a few seconds fills the capillary space between the cylinder and the slide, so that on looking through the cylinder the blood appears as a red line stretching across the slide (Fig. 2).

The cylinder is now moved forward with firm, even pressure till it reaches the other end (Fig. 3). The blood is drawn by capillarity *after* the cylinder, and a thin, evenly-spread film is left. The thickness of the film

depends on the amount of blood placed on the slide, and still more on the rate the cylinder is moved along, for the greater the rate the thicker will the film be. The best results are obtained when the cylinder takes one or two seconds to travel from one end of the slide to the other.

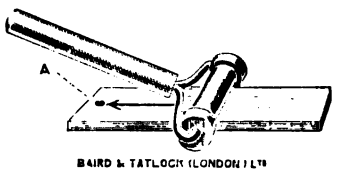


Fig. 2.

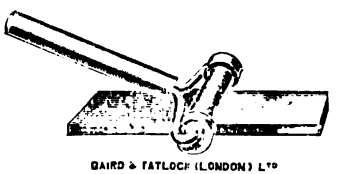


Fig. 3.

The advantages claimed for this method are—First, a thin, evenly-spread film can be obtained with the greatest ease; secondly, the blood is not subject to any rubbing or pressure as it is drawn along.

The little instrument can be obtained from Messrs Baird & Tatlock, 14 Cross-street, Hatton Garden, London, for two shillings and threepence, nickel plated. A cheaper form, costing about one shilling, is also made for laboratory use (Fig. 4).

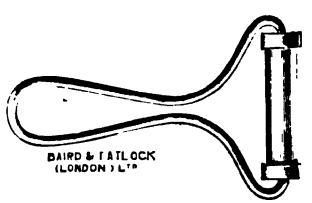


Fig. 4.

ON CERTAIN MARKINGS, DUE TO NERVES AND BLOOD-VESSELS, UPON THE CRANIAL VAULT; THEIR SIGNIFICANCE AND THE RELATIVE FREQUENCY OF THEIR OCCURRENCE IN THE DIFFERENT RACES OF MANKIND.

By A. FRANCIS DIXON, M.B., Sc.D.

[Read in the Section of Anatomy and Physiology, May 27, 1904.]

A few years ago[a] I drew attention to the grooves which may often be found on the surface of the frontal portion of the cranium, and which indicate the positions occupied during life by one or more of the branches of the supra-orbital nerves. As the grooves owe their origin to a want of agreement between the rate of growth in length of the overlying nerves and the rate of expansion of the cranium, it was suggested that those races of mankind in which the grooves occurred in large numbers were tending towards increased development of the frontal region of the cranium. Since the presence of the grooves possibly indicates the origin or progress of such a change in the cranial form, it becomes of interest to record their relative frequency, or absence, in a large series of crania, and note whether an examination shows that the grooves vary much in their frequency, or character, in the various races of mankind. For a long time I have felt convinced that these grooves occurred much more frequently in some races than in others, but it is only comparatively recently that I have been able to collect and arrange a relatively large number of observations regarding their presence, or absence. I have especially to thank Professor Stewart, Professor Macalister, Dr. Haddon and Professor Cunningham for their goodness in

[a] Proceedings of the Anatomical Society of Great Britain and Ireland, 1900. Also Report of the Meeting of the British Association, Bradford, 1900.

granting me every facility for examining the crania in their possession, or in their keeping.

The crania I have examined are for the most part those deposited in the Museum of the Royal College of Surgeons and in the Anatomical Museums of Cambridge and Dublin Universities. I have not been able, in the museums mentioned, to examine all the crania of each race, but those upon which notes have been made have not been in any way selected.

FIG. 1.—Cranium obtained in the dissecting-room. There is a wide, well-marked branched groove for the supra-orbital nerve, and a series of short tunnels for one of its smaller branches. The specimen is in the Anatomical Department, University College, Cardiff.

In all a very large number of crania have been noted, and on the whole the observations made since the publication of the first note strengthen the conclusions arrived at previously.

The grooves in question vary very much in their appearance, as they may be shallow and faint, or deeply cut and strongly marked. They are sometimes relatively wide and correspond in position with the main branches of the nerves, while in other cases they are finely cut and are found beneath the

smaller branches only (*see* figs. 1 to 6). In some cases the grooves are arranged in a branching system, which reproduces in a faithful manner the arrangement and distribution of the overlying nerves. This is well seen in several specimens in the Royal College of Surgeons, as for instance in the skull of a Kaffir (No. 1292), in the skull of a young negro (No. 1267), in the skull of a woman from Corro del Oro, S. America (No. 979), and in a West African negro (No. 1579, Barnard Davis Collection), and others. The Anatomical Museums of Cambridge and Dublin Universities also afford striking examples. In some of these the impressions produced by the nerves are so perfect that one can not only readily observe the position of many fine nerve branches, but also the places where communications took place between these branches. Sometimes a careful examination of the floor of the groove shows that there are parallel depressions in it, corresponding to the bundles of fibres which composed the nerve occupying the groove. These are very beautifully seen in the skull of a Kaffir (No. 1292) in the Royal College of Surgeons Museum, and also in an Egyptian cranium of the 12th Dynasty (No. 1392) in the Anatomical Museum, Cambridge.

Very often the grooves are converted into little tunnels within the frontal bone (*see* figs 2 and 5). These tunnels may begin within the orbital arch and lead upwards in the frontal bone, so that the contained nerve enters the scalp only after it has reached a considerable distance, sometimes as much as 18 mm. from the supra-orbital arch. In other cases the little tunnels are present further on in the course of the nerves, and are found to have both their upper and lower openings upon the anterior surface of the frontal bone.

In all the cases examined it was the supra-orbital nerve or its branches which had produced the grooves in question. In some it was evident that the grooves corresponded to the outer division of the nerve; in others, to the inner division. The

grooves may be present upon almost any part of the frontal portion of the calvaria except the region which lies near the mesial line of the cranium. Not unfrequently a groove may be found far out from the middle line, occupying a position just to the inner side of the attachment of the temporal fascia to the frontal bone. In these latter cases the grooves often exhibit an oblique cutting, as if produced by a pressure maintained vertically, and not one acting in a direction perpendicular to the sloping surface of the bone where the groove exists (well seen, for instance, in a Negro cranium from Quiloa, E. Africa, No. 1263, Royal College of Surgeons Museum, and in the cranium of an Egyptian woman of the 12th Dynasty, No. 1434, in the University Museum, Cambridge).

In the skull of a young girl aged about 17 years, in the possession of Professor Birmingham, not only does the anterior surface of the frontal bone exhibit grooves for the branches of

Fig. 2.—Cranium of an Eboe from W. Africa. There is a deep, wide supra-orbital groove for the outer division of the nerve. One branch of the groove almost reaches as far as the coronal suture, and is in part of its course converted into little tunnels. The specimen, which was brought home by Dr. R. A. Sheckleton, is in the Museum of Trinity College, Dublin.

the supra-orbital nerve, but the orbital plates of the frontal bone, where they lie in the roofs of the orbits, present distinct antero-posterior grooves for the frontal nerves.

There can, I believe, be no doubt that the grooves owe their origin to the fact that the increase in length of the nerves has not been in proportion to the expansion of the cranium. The nerves might indeed be looked upon as constricting cords, which tend to become buried in the growing cranial wall. It is interesting to note that the grooves never cross the coronal suture, although they sometimes reach it (*see* fig. 3). This is almost certainly due to the fact that at the suture the layers of the scalp are firmly bound down to the cranial wall. The grooves very often begin inferiorly at some little opening where a branch of the nerve has entered the bone. These little foramina can in most cases be shown to look upwards, as the entering nerve takes a recurrent course within the bone. The little foramina look upwards towards the coronal suture—where growth is most active—just as in the long bones of the skeleton the nutrient foramina open on the surface towards the end of the bone where growth is most active and goes on longest. Sometimes the frontal region of the skull shows a very large number of such minute foramina, from each of which a little groove leads upwards; each foramen with its groove resembling a comma mark with its tail directed upwards towards the coronal suture. I have found this condition most commonly in young thin frontal bones with smooth surfaces, but the marks in question are also often found in the skulls of old people. Like the better-marked grooves noted in this paper, the "comma marks" owe their origin to a want of proportion in the rate of growth in the frontal bone and the overlying structures. An examination of recent specimens shows that such marks although usually due to entering nerves, may also be caused by minute blood-vessels. Since the finer "comma marks"

are less frequently met with in aged crania, it is probable that the want of proportion between the rate of growth of the bone and the overlying structures is more marked in the young skull, and that later on (after 25th to 30th year) some adaptive moulding of the cranium may take place which brings about the removal of the little grooves leading upwards from the minute foramina. The "comma marks" here described are very well seen, for instance, in several skulls from Borneo presented by Dr. Hose to the University of Cambridge, and also in many Egyptian skulls (Nos. 3415, 3292, 3307, 3277, and many others) in the Museum of the same University. Examples are also found in a Hindoo, No. 633 (Barnard Davis Collection), in a Somali, No. 1250 D, and in many other crania in the Royal College of Surgeons Museum.

The marked grooves and tunnels for nerves, on the other hand, are not removed as the skull becomes aged, for such grooves and tunnels are found often deeply cut in crania of persons from 40 to 80 years of age.[a] Although this is so, I am inclined to believe that the most perfect examples of grooves, reproducing the actual pattern formed by the branching of the overlying nerves, will be found on the frontal regions of crania of ages varying from 15 to 30 years. The marked development of the grooves at these ages is probably to be associated with the relatively rapid increase in size of the anterior part of the skull which takes place between the 15th to 25th years. Many skulls considerably younger, however, show well-marked grooves for the supra-orbital nerves, as for instance the skull numbered 1147, Sandwich Isles, Barnard Davis Collection, Royal College of Surgeons, and estimated at 4 years old, also a "Jeune Bosjemane 8 ans," No. 3600, in the Museum of the Jardin des Plantes, Paris, and others.

[a] As, for instance, in the Singhalese cranium, estimated age 80 years, No. 731, Barnard Davis Collection, Royal College of Surgeons; also No. 1223, a North American male, aged 60, in the same collection, and many others.

We are probably correct in looking upon the nerves as extremely conservative, and as tending less towards variation than many other structures in the body. In the case of the motor nerves, attention has been called to this fact, and it

Fig. 3.—Cranium of an Eboe from W. Africa. There are well-defined grooves, reproducing the distribution of the main branches of the supra-orbital nerve. The grooves reach the coronal suture at one point. The little "comma marks" noted in the paper are also seen in the drawing. The specimen, which was brought home by Dr. R. A. Sheckleton, is in the Museum, Trinity College, Dublin.

has been shown that they often retain their primitive distribution to a very large extent, even after the structures which they at one time supplied have become rudimentary. In the case of the sensory nerves we have a rapid increase in length during early embryonic development, but when the nerves have reached the sentient surfaces to which they are distributed their growth is slow, and is only in proportion to the rate of expansion of the tissue which they traverse. It seems probable that the nerves may at first tend to lag behind, as regards their growth in length, in those cases where a tissue or part of the body is tending towards increased size.

We know that the frontal nerve and its supra-orbital con-

tinuation is, phylogenetically speaking, a late formation, in comparison, for instance, with the nasal nerve, and also that in man it takes its origin at a later stage in his developmental history. The growth of the nerve appears to be associated with the development of the cerebral hemisphere—especially its frontal portion—the protective coverings of which it supplies. We are probably correct in regarding the nerves as being less variable than the brain and skull; and if we are correct in doing so, the constricting action of the nerves to which the grooves are due is probably most marked in crania whose frontal regions are tending towards increased size and capacity. Indeed, it seems probable that the presence of marked constricting grooves, in a large proportion of individuals of the same race, might be taken as an indication that the race to which they belong is tending towards an increased development of the frontal part of the skull. On the other hand, the absence of grooves in the crania of any race would, in the same manner, indicate that no marked want of proportion in the rate of the growth of the nerves and the expansion of the cranium existed, and hence that the frontal region of the skull was therefore probably not tending towards increased development. I am inclined to believe that in those races which possess a relatively fixed type of cranium, as regards form and size, the grooves are of rare occurrence; and that the races in which the form and size of the cranium is more variable are those in which the grooves occur most commonly. At all events, the presence of grooves in a large percentage of cases may be an indication that we are dealing with a mixed race. As the crania in which the grooves are well marked are very often thin-walled, there can be no doubt that increased size of the frontal region does indicate increased capacity. A well-marked example of a thin-walled smooth cranium, showing the grooves typically developed, is afforded by a skull (No. 1424) in the Museum of

the Jardin des Plantes, Paris, described as "Type feminin, Race blanche (Alsacienne)."

It is possible that in observing the intimate relationship which exists between the supra-orbital nerve and the frontal bone, and which so often gives rise to grooves and tunnels in the latter, we are viewing the early stages of a process quite comparable to that by which the nasal nerve has assumed so complicated a course during phylogeny. The frontal nerve,

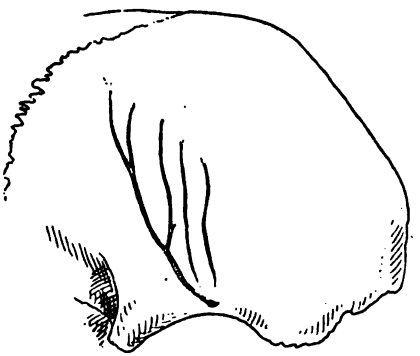


Fig. 4.—Portion of a prehistoric Irish cranium from Dundalk Grave Mound. A series of well-marked supra-orbital grooves are present, which reproduce in a remarkable manner the pattern formed by the overlying nerves. The specimen is in the Museum of Trinity College, Dublin.

like the nasal, may be tending to assume a deeper plane as regards the dermal, or roofing, bones of the cranium, and one can readily understand from an examination of the specimens how the frontal, like the nasal, might come to have a considerable portion of its course beneath the frontal bone, and thus apparently within the cranium.

In this connection, the skull of an Irish girl, preserved in the Catholic University School of Medicine, is of especial interest, since the frontal nerve lay within a groove on the under surface of the orbital plate of the frontal bone, while

its supra-orbital branch grooved the anterior surface of the calvaria.

I have examined the crania of a number of the anthropoid apes, and have been unable to find traces of these nerve markings on the fontal region in any specimen.

In a certain sense we might perhaps regard the presence of grooves in aged crania as indicating a retention of the con-

FIG. 5.—Cranium of a male subject obtained in dissecting-room. The frontal bone shows a series of remarkable tunnels, within which run the branches of the supra-orbital nerve. Deep grooves are also present. The outer division of the supra-orbital nerve enters the bone of the orbital plate of the frontal, 10 mm. behind the supra-orbital arch. Running within the bone the nerve breaks up into its smaller branches, which occupy little tunnels, and become superficial at a number of foramina which lead into little grooves. The frontal air siuuses are of small size. The calvaria is in the Anatomical Department, Trinity College, Dublin.

dition more common during the time of life that the frontal region of the cranium is rapidly expanding. Hence, in making deductions as to the relative frequency in which the grooves occur in the crania of different races, it is important that, as far as possible, we should compare only individuals of approximately the same ages. This is almost an impossibility at present; I have, however, as far as possible, noted the ages,

or estimated ages, of the skulls that I have examined, so as to be able to infer whether the differences in the numbers arrived at are or are not due to the fact that skulls of quite different ages have been compared. When ages are stated in this paper, they have been taken either from the descriptive labels of the specimens, or from the museum catalogues. I have not attempted myself to estimate the actual ages of any of the specimens upon which I have made notes. In the majority of museum specimens actual ages are not recorded; in the Barnard Davis Collection, however, in most specimens an attempt has been made to estimate the actual age.

I have been unable to find mention of, or reference to, these grooves in any published papers, but an examination of the illustrations in many descriptive papers dealing with the cranium of man shows that the grooves for the branches of the supra-orbital nerve have not by any means escaped observation. As examples, I may mention that several plates in A. de Quatrefages and Ernest T. Hamy's work on the Crania of the Races of Mankind illustrate the grooves in a very faithful manner. Further, the illustrations in question are for the most part drawn from those races in whose crania my observations show the grooves to be of frequent occurrence and often strongly marked.[a] The presence of the grooves is also indicated in a figure illustrating the cranium of a man past middle life, published in a paper by the late Professor Rolleston on "Crania from British Barrows." In connection with the causation of the grooves as suggested in this paper, the author's remarks concerning the cranium are of interest. He says:—"The supra-ciliary ridges are less marked in size and the forehead is less oblique than is usual in skulls of this period, which belonged to owners of such strength as the powerful and well-developed jaw speaks to." He also notes

[a] Les Cranes des Races Humaines, 1882; see plates 29, 30, 35, 36, 37, 71, 89, 93, and others.

that the skull in question, " being filled out in each individual region, gains an appearance of general smoothness and globosity."[a] In Topinard's *Anthropology*, English edition, 1878, the grooves are shown in fig 21, page 174.

The observations made and recorded in this paper show that the grooves do not occur in at all the same proportion in the different races of mankind, but that in certain races they are relatively of very frequent occurrence, while in others they are present very rarely. In some cases the crania collected from a certain district or island exhibit a relatively much higher or lower percentage of examples than one finds in the race to which they belong.

FIG. 6.—Cranium showing a deep, wide groove, converted into a tunnel in part of its course, for the main branch of the supra-orbital nerve. The lower end of the groove appears to constrict the supra-ciliary ridge. The frontal air sinuses are large, and extend upwards within the bone for a distance of one inch above the supra-orbital arch. The cranium is preserved in the Museum, Trinity College, Dublin.

In those races in which the total percentage of occurrences is high, the percentage of strongly marked grooves, and of grooves on both sides of the same frontal, is also high.

[a] Scientific Papers and Addresses, Rolleston, edited and arranged by Sir William Turner, vol. i., p. 186, and figs. on p. 188.

Similarly, the grooves are rarely well marked and rarely present on both sides of the cranium in those races in which the total percentage of occurrence is small.

In some races the grooves in question are of so frequent occurrence and are so well marked, in comparison with what obtains in others, that it is possible by merely observing the frontal aspects of the crania, as they are arranged in the museum cases, and noting the absence or presence of the grooves, to judge when one has passed from the crania of one race to those of another. This is most strikingly illustrated, for instance, when a collection of Australian or Melanesian crania is placed beside one of African Bantus.

Briefly stated, the supra-orbital grooves have been found to occur comparatively very rarely in Tasmanian, Australian, Eskimo, and Melanesian (including Papuan) crania, and to be much more frequently present in crania from West and South Africa. The races of Asia and Polynesia are intermediate between these extremes. Among Ancient Egyptians the grooves are of frequent occurrence, but they are by no means so common as among modern Nigritians and Bantus. American races seem to vary much among themselves as regards the relative frequency of these grooves, but here the grouping of the crania examined is probably not a natural one.

It is interesting to note that in cases where the grooves occur on one side only, it is the left side that is more frequently involved: the actual numbers noted are, left side alone, 131 cases; right side alone, 78 cases.

The presence, or absence, of grooves was not found to depend in any way upon the presence, or absence, of a supra-orbital notch or foramen; nor was the presence of metopic suture found to be associated with an excessive percentage of grooves.

AFRICA.

The crania obtained from Africa which I have been able to examine belong to the following groups:—

(*a*) Nigritians of Senegal—Mandingan, &c.
(*b*) Nigritians of Guinea—Ashantee, Yoruba, Dahoman, Eboe, &c.
(*c*) Western Bantus—specimens chiefly from French Congo.
(*d*) Eastern Bantus—specimens from Quiloa and Shiré River.
(*e*) Southern Bantus—Kaffirs and Zulus.
(*f*) Bushmen and Hottentots.
(*g*) Ancient Egyptians.

(*a*) *Nigritians of Senegal.*

17 crania (in the Royal College of Surgeons and in Trinity College, Dublin) were examined:—
13 exhibit no trace of grooves for the supra-orbital nerve or its branches;
3 show grooves on both sides of the frontal bone;
1 shows grooves on one side (right) only.

In all, grooves are present in 4 specimens, or 23.5 per cent., and both sides in 17.6 per cent.

The grooves are well marked in 2 cases.

Ages are stated in 3 cases, 25, 35, and 55 years; in none of these are the grooves in question present.

Sexes are stated in 5 cases—males 4, females 1; none of these show grooves.

(*b*) *Nigritians of Guinea.*

65 crania (chiefly in the Royal College of Surgeons Museum) were examined:—
23 exhibit no trace of grooves for the supra-orbital nerve or its branches;
29 show grooves on both sides of the frontal bone;
5 show grooves on the left side only;
8 show grooves on the right side only.

In all, grooves are present in 42 specimens, or 64.6 per cent., and on both sides in 44.6 per cent.

The grooves are strongly marked in at least 13 cases, and when strikingly developed are usually present on both sides, and often branched.

Ages (varying from 20 to 70 years) are stated in 27 of the crania examined:—

14 are 35 years of age or older, and of these 50 per cent. show grooves;

13 are 20 to 35 years of age, and of these 69 per cent. show grooves.

With regard to sex—in the specimens (36 in all) in which the sex is stated, a somewhat larger proportion (9.3 per cent.) of the crania which exhibit grooves are females.

The numbers are too few to yield a satisfactory result, but as far as they go they indicate that grooves for the supra-orbital nerve branches are present in a larger proportion of female than male skulls, and in crania under than over 34 years of age.

(*c*) *West African Bantus.*

76 crania (chiefly in the Royal College of Surgeons Museum) were examined:—

31 exhibit no trace of grooves for the supra-orbital nerve or its branches;

32 show grooves on both sides of the frontal bone;

7 show grooves on the left side only;

6 show grooves on the right side only.

In all, grooves are present in 45 cases, or 59.2 per cent., and on both sides in 42.1 per cent.

The grooves are strongly marked in at least 13 cases, and are often converted into tunnels.

Ages (varying from 16 to 70 years) are given in 45 of the crania examined:—

31 are 35 years of age or older, and of these 58 per cent. show grooves;

11 are 16 to 35 years of age, and of these 54.4 per cent. show grooves.

With regard to sex, in the specimens (70 in all, 35 male and 35 female) in which the sex is noted, a somewhat larger proportion (11.4 per cent.) of the crania are female.

As far as the numbers go, they indicate that grooves are more often present in the female than in the male, and in crania over than under 34 years of age. The last part of the statement holds for the crania of both sexes.

(*d*) *East African Bantus.*

27 skulls (chiefly in the Royal College of Surgeons Museum) were examined :—

11 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

14 show grooves on both sides of the frontal bone ;

1 shows grooves on the left side only ;

1 shows grooves on the right side only.

In all, grooves are present in 16 cases, or 59.2 per cent., and on both sides in 51.8 per cent.

The grooves are well marked in at least 6 specimens, and are often branched.

Ages, or sexes, are not stated in a sufficient number of cases to render analysis useful ; a large proportion of young adults.

Grooves are more frequent and better marked in specimens that are adult, and in those which have the third molar teeth coming into place than in those in which any of the milk teeth are retained.

(*e*) *South African Bantus.*

53 skulls (18 Zulus and 35 Kaffirs) were examined :—

21 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

23 show grooves on both sides of the frontal bone ;

4 show grooves on the left side only ;

5 show grooves on the right side only.

In all, grooves are present in 32 cases, or 60.4 per cent., and on both sides in 43.4 per cent.

The grooves are well marked in at least 14 specimens.

Ages and sexes are not stated in a sufficient number of cases to render comparisons possible. It is interesting to note that a cranium of a man (Zulu) aged 70 shows marked grooves on both sides. The proportion of cases in which grooves are present is greater in the case of the crania marked " Zulu " than in those marked " Kaffir."

(*f*) *Hottentots and Bushmen.*

33 skulls (chiefly in the Royal College of Surgeons Museum) were examined :—

13 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

13 specimens show grooves on both sides of frontal bone ;

7 specimens show grooves on the left side only.

In all, grooves are present in 20 cases, or 60.6 per cent., and on both sides in 39.4 per cent. Among the specimens whose ages and sexes are stated, the grooves occur in a larger proportion of female than male skulls, and in skulls under than over 35 years of age. The number of cases is, however, very small (14 females and 5 males).

(*g*) *Ancient Egyptians.*

322 skulls (nearly all in the University of Cambridge) were examined, including Roman Age 128, 12th Dynasty 143, no date 51 :—

215 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

65 show grooves on both sides of the frontal bone ;

32 show grooves on the left side only ;

10 show grooves on the right side only.

In all, grooves are present in 107 cases, or 33.2 per cent., and on both sides in 20.2 per cent.

Sexes and ages are not stated in a sufficient number of cases to render analysis useful.

In a number of cases the grooves are well marked, and they often reproduce the nerve-branching ; in many cases the little foramina and grooves described above are well marked.

Asia.

The Asiatic races, specimens of whose crania have been examined, may be grouped as follows :—

(*a*) Chinese.

(*b*) Burmese.

(*c*) Races of India and Afghanistan.

(*d*) Races of Ceylon.

(*a*) *Chinese.*

71 crania (chiefly in the Royal College of Surgeons Museum) were examined :—

57 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

8 show grooves on both sides of the frontal bone ;

4 show grooves on the left side only ;

2 show grooves on the right side only.

In all, grooves are present in 14 specimens, or 19.7 per cent., and on both sides in 11.3 per cent.

In only 2 cases are the grooves at all conspicuous; in all the others the grooves, when present, are feebly marked and shallow. The 2 cases in which they were well developed are—"A Taeping Rebel" (No. 701, Royal College of Surgeons Museum), in which the cephalic index is 754, and "A Chinaman," from Insin gaol, Burma (Trinity College Museum), in which the cephalic index is 713. In both these the grooves are multiple, but in the latter they are very shallow. The grooves occur in a larger proportion of the female than of the male skulls examined; they are equally common in crania between 20 and 40 and between 40 and 75 years of age.

(*b*) *Burmese.*

26 crania (in the Museum, Trinity College, Dublin) were examined:—

23 exhibit no traces of grooves for the supra-orbital nerve or its branches;

3 show grooves on both sides.

In none of the specimens are the grooves strongly marked.

(*c*) *Races of India and Afghanistan.*

153 crania (chiefly in the Barnard Davis Collection, Royal College of Surgeons) were examined:—

125 exhibit no traces of grooves for the supra-orbital nerve or its branches;

18 show grooves on both sides of the frontal bone;

7 show grooves on the left side only;

3 show grooves on the right side only.

In all, grooves are present in 28 specimens, or 18.3 per cent., and on both sides in 11.8 per cent.

In only a few cases are the grooves strongly marked; they are, however, well developed in No. 642 and in No. 599 (Barnard Davis Collection, Royal College of Surgeons), both crania of women of 40 years of age. In a considerable number of cases the "comma" marks described above are well seen.

The percentage of occurrence in the skulls (137 in number) in which the sex is stated is somewhat greater for the male than for the female (16 per cent. and 12.5 per cent.).

In 132 cases ages are stated, and grooves are found to be more common by 4.5 per cent. among specimens whose ages vary between 16 and 30 years than among those whose ages vary between 36 and 80 years.

(*d*) *Races of Ceylon.*

(1) Veddahs.

32 crania (chiefly in the Royal College of Surgeons Museum) were examined :—

27 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

2 show grooves on both sides of the frontal bone ;

2 show grooves on the left side only ;

1 shows grooves on the right side only.

In all, grooves are present in 5 specimens, or in 15.6 per cent., and on both sides in 6.2 per cent.

The grooves appear to be about equally common in the two sexes, but the number of cases in which the sex is stated is not large.

The grooves are perhaps best marked in No 680D, male (Royal College of Surgeons), and in No. 721 Barnard Davis Collection (Royal College of Surgeons).

It is interesting to note that there is a well-marked groove on the right side of No. 679, female (Royal College of Surgeons), in which the cranial capacity is only 960.

(2) Singhalese.

27 crania were examined (17 of which are stated to represent the prevaling type of lower class, Colombo) :—

20 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

5 show grooves on both sides of the frontal bone ;

2 show grooves on the right side only.

In all, grooves are present in 7, or 25.9 per cent., and on both sides in 18.5 per cent.

The grooves are best seen in a male aged 80 years (No. 731, Barnard Davis Collection, Royal College of Surgeons), in which they are multiple, branched, and long ; they are in part converted into tunnels.

Andaman Islands.

27 crania (in the Royal College of Surgeons Museum) were examined ;

21 exhibit no trace of grooves for the supra-orbital nerve or its branches ;

3 show grooves on both sides ;

3 show grooves on the left side only.

In all, grooves are present in 6 cases, or 22.2 per cent., and on both sides in 11.1 per cent.

In no case are they well marked.

AUSTRALIA.

147 crania (chiefly in the Royal College of Surgeons Museum) were examined:—

136 exhibit no trace of grooves for the supra-orbital nerve or its branches;

4 show grooves on both sides of the frontal bone;

5 show grooves on the left side only;

2 show grooves on the right side only.

In all, grooves are present in 11 cases, or in 7.5 per cent., and on both sides in 2.7 per cent.

In the Australian crania, which present grooves, we have to do with short or faintly-marked depressions, except in 2 cases in which the grooves are typically, though not strongly, developed. These two cases are No. 1,055, female, Royal College of Surgeons Museum, in which there is a simple unbranched groove on the left side, and a skull in the possession of Dr. Haddon, obtained from Somerset, Australia. This latter specimen exhibits typical grooves on both sides. One of the specimens, No. 1,050A, which shows the supra-orbital grooves on both sides of the frontal, is remarkable, for an Australian, in having a capacity of 1,630.

TASMANIA.

40 crania (in the Royal College of Surgeons Museum) were examined:—

39 exhibit no trace of grooves for the supra-orbital nerve or its branches;

1 shows a faint groove on the left side only.

In all, grooves are present in 1 case, or 2.5 per cent.

At least 13 of the specimens are under 30 years of age.

MELANESIA.

186 crania (Museums of Royal College of Surgeons, Cambridge and Dublin Universities) were examined:—Fiji Islands 54, New Caledonian Isles 19, New Hebrides 40, Solomon Isles 10, and New Ireland 63 crania.

167 exhibit no traces of grooves for the supra-orbital nerves or its branches;

5 show grooves on both sides of the frontal bone;

10 show grooves on the left side only;

4 show grooves on the right side only.

In all, grooves are present in 19 specimens, or in 10.2 per cent., and on both sides in 2.7 per cent.

In only 2 specimens are the grooves well marked on both sides.

In 40 cases the ages given in the catalogue are under 35 years; 5 of these, or 12.5 per cent., show grooves. In the cases (31 in all) in which sex is mentioned, the grooves occur twice as often in the female as in the male.

Papuans.

New Guinea and Isles of Torres Straits.

100 crania (chiefly in Trinity College, Dublin, and in Cambridge) were examined:—

88 exhibit no traces of grooves for the supra-orbital nerve or its branches;

7 show grooves on both sides of the frontal bone;

4 show grooves on the left side only;

1 shows grooves on the right side only.

In all, grooves are present in 12 per cent., and on both sides in 7 per cent.

The grooves are well marked in only 1 case (from Island of Mer), and but slightly marked in all others.

A large number of the skulls appear to have been those of young adults, but age and sex is given in only a few cases.

Polynesia.

298 crania were examined (from Samoa and Tonga 12, Tahiti 4, Chatham Isles 63, New Zealand 57, Marquesas 34, Sandwich Isles 128 specimens), chiefly in the Royal College of Surgeons Museum:—

231 exhibit no trace of grooves for the supra-orbital nerve or its branches;

29 show grooves on both sides of the frontal bone;

22 show grooves on the left side only;

16 show grooves on the right side only.

In all, grooves are present in 67 cases, or 22.5 per cent., and on both sides in 9.7 per cent.

In few cases are the grooves deeply cut, but several examples of well-defined multiple grooves are to be found. In cases where both age and sex are stated, the grooves are more common in the female than in the male; in the former they occur in 19 cases out of 62, in the latter in 10 out of 67. Of the 19 females, 10 are 35 years old or older, and the remainder are under 35 years of age; of the 10 males, 8 are 35 years of age or older.

BORNEO.

86 crania were examined (Hose Collection in Cambridge University, and others in the Royal College of Surgeons):—

69 exhibit no trace of grooves for the supra-orbital nerve or its branches;

12 show grooves on both sides of the frontal bone;

4 show grooves on the left side only;

1 shows grooves on the right side only.

In all, grooves are present in 17 cases, or 19.8 per cent., and on both sides in 14 per cent.

Many of the crania are those of young persons.

JAVA.

41 crania (chiefly in the Royal College of Surgeons Museum) were examined:—

38 exhibit no trace of grooves for the supra-orbital nerve or its branches;

1 shows grooves on both sides;

2 show grooves on the left side only.

In all, grooves are present in 3 cases, or 7.3 per cent., and on both sides in 2.4 per cent.

In no case are the grooves well marked.

In 28 cases, ages varying from 25 to 35 are given. The specimens showing grooves are 1 female, aged 35, and 2 males, aged 35 and 45.

N. AMERICA.

Eskimos.

52 crania (chiefly in the Royal College of Surgeons Museum) were examined:—

48 exhibit no trace of grooves for the supra-orbital nerve or its branches;

2 show grooves on both sides;

1 shows grooves on the left side only;

1 shows grooves on the right side only.

In all, grooves are present in 4 cases, or 7.7 per cent., and on both in 3.8 per cent.

The grooves are well marked in 2 cases.

Natives of the West Coast.

58 crania (in the Royal College of Surgeons Museum) were examined:—

50 exhibit no traces of grooves for the supra-orbital nerve or its branches;

4 show grooves on both sides of the frontal bone;

2 show grooves on the left side only;

2 show grooves on the right side only.

In all, grooves are present in 8 cases, or 13.8 per cent., and on both sides in 6.9 per cent.

Eastern and Central Regions.

36 crania (in the Royal College of Surgeons Museum) were examined:—

26 exhibit no trace of grooves for the supra-orbital nerve or its branches;

5 show grooves on both sides of the frontal bone;

4 show grooves on the left side only;

1 shows grooves on the right side only.

In all, grooves are present in 10 cases, or 27.8 per cent., and on both sides in 13.9 per cent. The grooves are well marked in 2 cases; one of these, female, aged 60, No. 1,220, Barnard Davis Collection, in which the "sutures are greatly obliterated, somewhat prematurely"; the other is a male, aged 60, in which many of the sutures are ossified.

Central America and the Antilles.

21 crania (in the Royal College of Surgeons Museum) were examined:—

19 show no trace of grooves for the supra-orbital nerve or its branches;

2 show grooves on the right side of the frontal bone.

S. AMERICA.

Guiana and Colombia.

33 crania (in the Royal College of Surgeons Museum) were examined:—

30 exhibit no trace of grooves for the supra-orbital nerve or its branches;

2 show grooves on both sides of the frontal bone;

1 shows grooves on the left side only.

In all, grooves are present in 3 cases, or 9.1 per cent., and on both sides in 6.1 per cent.

The grooves are not well marked in any of the specimens.

Peru.

168 crania (in the Royal College of Surgeons Museum) were examined:—

129 exhibit no trace of grooves for the supra-orbital nerve or its branches;

27 show grooves on both sides of the frontal bone;

3 show grooves on the left side only;

9 show grooves on the right side only.

In all, grooves are present in 39 cases, or in 23.2 per cent., and on both sides in 16.1 per cent.

The grooves are well seen in Nos. 966 and in 979, Royal College of Surgeons Museum, and also in Nos. 1,288, aged 50, and 1,314, aged 20, in the Barnard Davis Collection. In all the other cases the grooves, when present, are but faintly marked.

I have examined a large number of crania in order to note whether regions other than the frontal commonly show any markings demonstrating a want of correspondence in the growth rate of the superficial and deep structures comparable to that which is responsible for the grooves described in this paper, and have found such markings in the occipital regions in many cases. If one examines the occipital region in the skulls of children, one will very frequently find that shallow but distinct grooves are to be seen on the part of the bone which lies between the highest and superior curved lines. These apparently correspond to the overlying occipital vessels, and I have little doubt that they owe their origin to

a want of proportion in the rate of growth in the overlying vessels and the rate of expansion of the occipital portion of the cranium. In support of this view one can easily demonstrate that in the crania in which the grooves are present the distance between the superior and highest curved lines is both

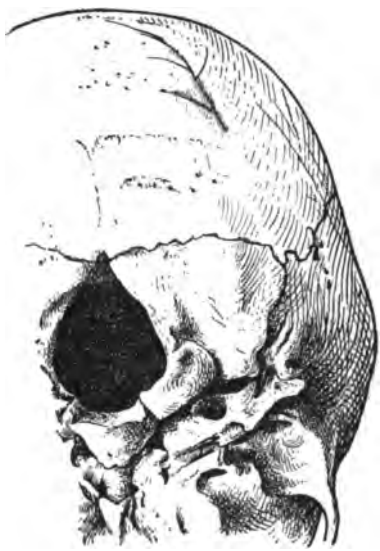


Fig. 7.—Under aspect of the occipital region of the cranium in an Eskimo child showing groove for the occipital vessel. The groove, which is a branched one, lies in the interval between the superior and highest curved lines, and this interval is very wide. The specimen is in the Anatomical Department, University College, Cardiff.

relatively and actually very great, so that the structures lying superficial to this part of the cranium are probably more stretched than they are at a later age, when the occipital region of the cranium has ceased to expand at a rate relatively rapid to that which obtains in other parts of the cranium. The markings are well seen in the young Eskimo cranium (in the Anatomical Department, University College, Cardiff), from which the drawing fig. 7 was made; they are also to be

seen in the following among many others:—Egyptian child, 12th Dynasty, No. 1545, University Museum, Cambridge; Negro child, E. Africa, No. 1272, Museum, Royal College of Surgeons; Australian child, Queensland, No. 1043D, Museum, Royal College of Surgeons; and Patagonian child, Museum, Trinity College, Dublin. I have not found these markings in any adult cranium nor in any young one in which the distance between the superior and highest curved lines was not relatively very great.

THE EFFECTS OF PITUITARY FEEDING ON NITROGENOUS METABOLISM.

By HENRY M. JOHNSTON, B.A., M.B.

[Read in the Section of Anatomy and Physiology, May 27, 1904.]

At a former meeting of this Section of the Royal Academy of Medicine, Professor Thompson described some researches he had made with a view to discover what effect the administration of pituitary substance would have on metabolism. This experiment, the results of which I have the privilege to bring before you this evening, must be regarded as a continuation of those already made by him.

The pituitary substance used in this case was obtained from young animals—calves—and for that reason was more active and produced a more marked result. The experiment was carried out as before on a dog, which was placed in a cage of such construction that any urine passed in the intervals between the successive catheterisations could be completely recovered.

At a definitely fixed time each morning the catheter was passed, and the urine withdrawn into a flask. The weight of the dog was then taken, and the fæces collected and weighed. She was fed on a diet consisting of 100 grammes of meat, 50 grammes of lard, and 125 grammes of dried bread crumb, thoroughly mixed together. She was also given 300 cc. of water. In the evening the catheter was again passed, and 200 cc. more water given. The urine of the evening was added to that of the following morning. Passing the catheter twice during the twenty-four hours was not essential, but it was done to prevent any

urine being passed into the cage during the night which necessitated the cage being washed and the urine filtered. It was so far successful that on only one occasion throughout the experiment did this accident occur.

The urine was treated in the following way:—It was first measured, then diluted with distilled water to 500 cc. Of this diluted urine 5 cc. were taken, in which the total nitrogen was estimated by Kjeldahl's method. In another 5 cc. the urea was estimated by Merner's method, and in 50 cc. the phosphates were determined by titration with standard uranium acetate solution. A duplicate experiment was done in each case, and the mean of the results taken. These results always closely approximated.

The fæces of each day were treated as follows:—They were added to those of the preceding day in a large porcelain dish, moistened with 10 per cent. sulphuric acid in alcohol, then evaporated over a water bath.

After some days the total nitrogen excreted by the urine becomes more or less regular in amount, and a condition of nitrogenous equilibrium is established. It took twenty-two days to attain to this regularity, owing to the fact that at first the dog did not eat her food as soon as it was given, but often in the evening a certain amount remained unconsumed. Of these twenty-two days only the last twelve were taken into account, except for the fæces, in which case the total weight of the twenty-two days mixed in the capsule was used to estimate the total nitrogen contained.

When the nitrogenous equilibrium had thus been arrived at, one gramme of pituitary substance obtained from calves was added to the original diet for each day for eight days.

This pituitary substance had been subjected to the following treatment:—The fresh pituitary bodies were

chopped up fine, spread on plates of glass, and dried in an oven at a temperature of 35° to 40° C.

During this second period in which pituitary was given, the total nitrogen, urea, and phosphates were estimated as before, and the fæces collected together into a second capsule and also dried.

On the twentieth day the pituitary was omitted from the diet; the total nitrogen, urea, and phosphates determined daily as before, the fæces being collected into a third capsule.

After four days the experiment was brought to a close, and the animal liberated. The fæces of the three periods were separately ground up, dried at 110° C., and the total nitrogen estimated in each.

The results obtained were as follow:—

The Weight of the Dog.—During the first period this rose from 17,500 grammes to 17,900 grammes, which point it reached when pituitary was given. It fell during the first five days of the second period to 17,650 g., but rose before pituitary was stopped, perhaps owing to more fluid being retained in the system. When pituitary was stopped it continued to rise, reaching 18,000 g. at the end of the experiment.

The Total Nitrogen in the Urine.—During the first ten days there was a little irregularity, but on the eleventh and twelfth it was practically the same in amount—4.774 g. and 4.795 g. On the fourteenth day it rose in amount to 5.502 g.—higher than it had ever attained before; on the fifteenth day, 5.201 g.; on the sixteenth day, falling to 4.690 g.; rising again on the seventeenth and eighteenth to 5.537 g.; on the nineteenth falling to 4.949 g.; and on the twentieth attaining to 5.537 g. In the period after pituitary was stopped it still varied considerably, and although it fell on the twenty-second day

to 4.137 g.—lower than it had reached previously—at the end of the experiment there was an output of 5.278 g. daily.

The Urea.—This was found to follow an almost identical course during the three periods. The amount of urea excreted daily was estimated in terms of its content of nitrogen. It will be seen from the table to also rise greatly in amount during the second period.

The Phosphates.—During the second period they gradually rose in amount, not presenting so much irregularity as the total nitrogen and urea.

The Fæces.—The average daily elimination of nitrogen in the fæces was .990 g., in the first period; in the second, 1.12 g.; in the third period, 0.880 g., showing an increase of about 13 per cent. in the period the animal was under pituitary substance.

The total nitrogen in one gramme of pituitary as given was also estimated; this was found to be .114 g. in amount. This increase in the amount of nitrogen in the diet is evidently far too small to account for the increased elimination. The effects of pituitary seem to be:—

1st. Nitrogenous metabolism is considerably stimulated, the total nitrogen, urea, and phosphates in the urine being increased.

2nd. The weight of the animal falls.

3rd. Nitrogenous equilibrium does not return at once after the pituitary has been omitted from the diet.

How long it is before the output of nitrogen again becomes constant was not in this case determined, as, owing to pressure of other work, the experiment had to be brought to a close.

EFFECT OF PITUITARY ON A DOG.

1st period before pituitary was given.

Day	Weight gr.	Total Vol. of Urine cc.	Total N. in Urine gr.	Total Urea N. gr.	Total Phosphates gr.
1	17,500	375	4.662	—	.880
2	17,000	425	4.620	3.752	.805
3	17,700	305	4.725	4.018	.880
4	17,700	385	4.669	3.955	.845
5	17,800	402	4.970	4.151	.885
6	17,500	310	4.746	4.046	.795
7	18,500	375	4.613	3.794	.845
8	17,800	365	4.956	4.067	.847
9	17,800	380	4.522	3.696	.850
10	17,900	395	4.942	4.165	.780
11	17,900	325	4.774	3.955	.945
12	17,900	345	4.795	4.004	.912

Total weight of Fæces dried at 110° C = 468.62 gr., containing 21.8 gr. N. or .990 gr. N. daily excreted for 22 days.

2nd period pituitary given.

Day	Weight gr.	Total Vol. of Urine cc.	Total N. in Urine gr.	Total Urea N. gr.	Total Phosphates gr.
13	17,900	355	4.592	3.766	.795
14	17,900	400	5.502	4.620	.9125
15	17,750	380	5.201	4.270	.822
16	17,700	355	4.690	3.808	.887
17	17,650	320	5.194	4.221	1.095
18	17 800	355	5.537	4.627	1.022
19	17,800	305	4.949	3.843	1.057
20	17,800	380	5.537	4.382	1.120

Total weight of Fæces = 187.29 gr., containing 8.97 average daily excretion = 1.12 gr. N.

3rd period.

Day	Weight gr.	Total Vol. of Urine cc.	Total N. in Urine gr.	Total Urea N. gr.	Total Phosphates gr.
21	17,700	370	4.452	3.493	.9775
22	17,950	355	4.137	3.05	.872
23	17,950	335	5.208	4.438	.932
24	18,000	405	5.278	—	1.037

Total weight of Fæces = 75.01 gr., containing 3.525 gr. N. average daily excretion = 8.81 gr. N.

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